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a region not too crowded with corpuscles of the same kind does its identity remain (nearly) unambiguous."[7]

Thus, we see our conception is another attempt to bridge the Relativistic thought with Quantum theory.[8]

Perhaps the relation between the 'articulatory' time and the 'acoustic' time is analogous to the transformation in E. A. Milne's *Kinematic Relativity* $T = t_0 \log (t/t_0) + t_0$
where T is the Newtonian time and t is the 'radioactive' time. According to MILNE t is the fundamental scale and $t = 0$, being associated with a point-origin of his uniformly expanding model. This belief, based on physical grounds, leads to the result of the transformation $T = \ \ \alpha$ as a mathematical consequence.[9]

But the exact relation between the two times in the alpha-phonoid theory is only a postulate purely on *a priori* grounds, for idealised signalling, for the purpose of communication.

From the indeterminate alpha-phoneme, we arrive, as it were, at the two valued logic, even as "when the quasi-Boolean algebra reduces to a two-element Boolean algebra (which is a particular case of the simple quasi-Boolean algebra), we have the ordinary or classical two-valued logic.[10]

Thus the alpha-phonoid is a "punctiform beginning in time" as it were. Also the alpha-phonoid, being the stimulus—(steady state) response identity, will obviously give us a far wide and deep insight.[11] It is to be noted here that "Einstein himself always recognised a new theory only if it uncovered a new field of the physical world."[12]

7. Cf. Erwin Schrödinger, *Ibid.*,

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Facts themselves do not yield to scientific knowledge without a conceptual (or even beyond it 'symbolic') construction (Cf. Einstein, quoted by me on p. 227, foot note 21a, BDCRI, Vol. 12, Cf. also Bertrand Russell, Introduction to Mathematical Philosophy, 1919, p. 61; A. S. Eddington, The Philosophy of Physical Science, Cambridge at the University Press, 1939, p. 152).

9. Cf. G. J. Whitrow, The Brit. J. for the Philos. of Science, Vol. V, No. 18, August 1954, p. 151.

10. Cf. R. Vaidyanathaswamy, Quasi-Boolean Algebras and manyvalued Logics, Proc., of the Ind. Acad. of Sciences, Vol. 8, Section A, 1939, p. 170.

11. Foot note 33, BDCRI, Vol. 12, p. 410.

12. Philip Frank, Einstein, London, 1948, p. 164; cf. also here Einstein's following words regarding the modern development of theoretical science.

"The hypotheses with which it starts become steadily more abstract and remote from experience, On the other hand it gets nearer to the grand aim of all

selves to pure intellectual constructs. In other words, the *actor* (vibration-phenomena) merge into the *stage* (the *time*), i.e., 'instantaneous entities' (with which we have started) are *really* only *instant-entities*. This is in strict consonance with the relativistic thought that "Matter and the (field-or wave-like) propagation of something transmitting the interaction ought better to be regarded as the *shape* of (space-) time itself, which ought not to be looked upon as being conceptually prior to what was hitherto called its content; no more than, say, the corners of a triangle are prior to the triangle." [4]

The *outside* is merely the *inside*, but the outside as only an 'empirical phenomenon' ceases to exist now.[5] But, on the contrary, the *outside*, in this perspective, is only a relation of relations.[6]

We find this again agreeing with the Quantum theory which "tells us that what was formerly considered as the most obvious and fundamental property of the corpuscles, so much so that it was hardly ever mentioned, namely their being identifiable individuals has only a limited significance. Only when a corpuscle is moving with sufficient speed in

3. See BDCRI, Vol. 12, p. 221.

Cf. too, "Unless thou hear'st, thou canst not see,
Unless thou seest, thou canst not hear.
To hear and see, this is the second stage."

The Voice of Silence, translated by H.P.B., The Theosophical Publishing House, London 68, Great Russell Street, London, W.C.I., 15th reprint, 1937, p. 34.

Obviously, the symbolic interpretation of *hearing* and *seeing* here, according to us of course, in a more penetrating sense, are the *articulatory* (or the *auditory*) and the acoustical levels.

Note also that the true 'eye-sight' in the occultic sense, is referred to as 'of the mountain eagle', and the 'hearing' as 'of the timid doe' (The Voice of Silence, p. 57). Again, "the deva-sight and deva-hearing are not obtained in one short birth", (*Op. cit.*, p. 58).

If to hear and see is the *second stage*, the *first stage* we would interpret as the Alpha-phoneme which is the Ground of timeless awareness in which the multifarious and the time-bound psyche operates (Aldous Huxley, Perennial Philosophy, 1947, Chatto and Windus, London, p. 38).

At the alpha-phonoid, both the 'acoustical' and the 'asticulatory' levels of experience co-exist.

4. Erwin Schrödinger, Nature and the Greeks, Cambridge at the University Press, 1954, p. 14.

5. For an attempt to construct a radically empirical philosophy of Neutral Monism, see Whatley Carington, Matter, Mind and Meaning, Methuen, London; see also *Ibid.*, the preface by H. H. Price, pp. xi-xx.

6. BDCRI, Vol. 12, pp. 231-2; DCMS, No. 7, 1951, p. 31, foot note 81; BDCRI, Vol. 12, p. 405.

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"The hypotheses with which it starts become steadily more abstract and remote from experience. On the other hand it gets nearer to the grand aim of all

The alpha-phonoid invites us to the belief of the 'aesthetically inaccessible' alpha-phoneme even as the father of the epileptic in the Gospel[13] exclaimed, 'Lord, I believe; help thou mine unbelief'. "That is to say : 'Give me those emphatic visceral responses which I long for' "[14]

The belief in the alpha-phonoid emphasises the fact that "there has been forced between us (I mean by *us* : our bodily organism), and the object of thought in question, a definitely physiological nexus." The alpha-phonoid is "assented to not by the machinery of our intellect, but by that of our 'visceral reflexes' which replace the "purely logical conclusion which Tennyson calls : 'The freezing reason's colder part' ".[15]

In short, here is yet another attempt to unlock the problem of the *Nature of Belief*, "carrying a very long way forward the Aristotelian palisade which at present excludes from *Logic* all that relates to *Belief*" by the key of Neuro-physiology.[16]

science, which is to cover the greatest possible number of empirical facts by logical deductions from the smallest possible number of hypotheses or axioms. Mean while the train of thought leading from the axioms to the empirical facts or verifiable consequences gets steadily longer and more subtle. The theoretical scientist is compelled in an increasing degree to be guided by purely mathematical, formal considerations in his search for a theory, because the physical experience of the experimenter cannot lift him into the regions of highest abstraction. The predominantly inductive methods appropriate to the youth of science are giving place to tentative deduction. Such a theoretical structure needs to be very thoroughly elaborated before it can lead to conclusions which can be compared with experience. Here too the observed fact is undoubtedly the supreme arbiter; but it cannot pronounce sentence until the wide chasm separating the axioms from their verifiable consequences has been bridged, by much intense, hard thinking. The theorist has to set about this Herculean task in the clear consciousness that his efforts may only be destined to deal the death blow to his theory. The theorist who understands such a labour should not be carped at as 'fanciful'; on the contrary, he should be encouraged to give free rein to his fancy, for there is no other way to the goal. His is no idle day-dreaming, but a search for the logically simplest possibilities and their consequences." (Albert Einstein, The Problem of Space, Ether, and the Field in Physics, Man and the Universe, The Philosophers of Science, The World's Great Thinkers edited by Saxe Commins and Robert N. Linscott, MPL, 1954, p. 479); it is useful to remember also the following words of T. S. Elliot in this connection (T. S. Elliot's Introduction to Blaise Pascal's Pensees, Everyman's Library 874, 1943, p. x): "Neither does even the higher forms of religions inspiration suffice for the religious life; even the most exalted mystic must return to the world and use his reason to employ the results of his experience in daily life" (Cf. too, "Earth is the foundation", Sri. Aurobindo On Himself, Pondicherry, 1953, p. 181).

13. Holy Bible, S. Mark, 9th Chapter, verse 24).

14. Sir Almroth Wright, Alethetropic Logic, London, William Heinemann Ltd., 1953, p. 27).

15. *Ibid.*, p. 18.

16. *Ibid.*, p. 8.

This attempt at the psychological analysis of 'orthoaesthodic Believing'[17] where reflex action of viscera caused by *efferent nerve currents* (often of higher potential than the *afferent* current) gives a "condition of physiological relief" a relief from "neurotic tension" (which would have been otherwise caused by *afferent* currents that fail to elicit reflex response)[18] is really an emphasis on the 'psycho-physiological event',[19] bringing 'kinematurgical assurance',[20] i.e., the realisation of the truth of the following statement :—

"The ground in which the multifarious and time-bound psyche is rooted is a simple timeless-awareness"[21]—the alpha-phoneme—which is 'aesthetically inaccessible' (i.e., that which is beyond the reach of the senses).

" '*Le coeur*'—says Pascal—'*a des raisons que la raison ne connait point*' ".[22]

In the light of such a conception as this, we have already made the assumption that any consonant-vowel configuration is *not* equal to the same reversed vowel-consonant configuration.[23] We now proceed to record the following experimental details verifying the above stated assumption.

Part II : Experimental Details

For the preliminary exploration of this aspect of speech, the following instruments were used :

1. The Cossor 1049 Industrial Model double beam oscilloscope.
2. The Avimo 35-mm. Continuous film recording camera.
3. General Radio Co. Type 813 tuning fork oscillator 1000c/s.
4. The Concertone tape recorder.

For this study only one consonant and one vowel were used in various combinations. All the utterances were made by one subject as far as possible at the same pitch.

17. *Ibid.*, p. 8.
18. *Ibid.*, p. 21.
19. *Ibid.*, p. 24.
20. *Ibid.*, p. 13.
21. Aldous Huxley, The Perennial Philosophy, 1947, London, p. 38.
22. As quoted by Sir Almroth Wright, Alethetropic Logic, p. 2; cf. also Pascal's Pensees, translated by W. F. Trotter, Everyman's Library, 874, 1943, p. 73.
23. Cf. BDCRI, Vol. 12, p. 403.

The recordings were first made on the tape and then they were rerecorded from the tape on to the film with the Cossor oscilloscope and the Avimo camera once directly, i.e., with the tape running in the normal direction, and once reversed, i.e., with the tape running in the opposite direction.[24]

We thus had two sets of records :

(1) Phonemically direct and phonemically reversed utterances: e.g. : *kākā* (direct) and *ākāk* (reversed).

(2) Mechanically direct and mechanically reversed utterances (respectively corresponding to the above) :

e.g. : *kākā* (direct) and *ākāk* (direct),
ākāk (reversed) *kākā* (reversed).

The output of the oscillator was fed to the second beam of the oscilloscope throughout the recording to facilitate the measurement of duration, etc., on the record.

The tables below give the values observed for the duration and pitch of various speech sounds in our records :

TABLE I

(Direct Record from Tape)

Sound sequence uttered : *a:ka:k*
$\sigma = 0.001$ second.

Speech sound	Duration in σ	Frequency of voice	Remarks
? (glottal release,	19		
	7.5	133.3	
	8	125	
	8	125	
	7.5	133.3	(continued)

24. The tape recorder had the disadvantage of not being capable of being played in the reversed direction. It was therefore necessary to interchange the reels which thereby necessitated the reversal of the coated and non-coated sides of the tape. Thus during the reversed playing the non-coated side was facing the reproducing head, the resulting amplitude being thus smaller than in the case of the direct playing.

TABLE I—(*Contd.*)

Speech sound	Duration in σ	Frequency of voice	Remarks
	8	125	
	8	125	
	8	125	
	7.5	133.3	
a :	8	125	
	7.5	133.3	
	8	125	
	8	125	
	8	125	
	8	125	
	31		Indefinite with voice-like vibrations (=g).
	53		Silence.
k	18		Indefinite.
	6.5	153.8	
	7	142.9	
	7	142.9	
	7.5	133.3	
	7	142.9	
	7	142.9	
	7.5	133.3	
a :	7	142.9	
	7	142.9	
	7	142.9	
	7	142.9	
	7	142.9	
	6.5	153.8	
	7	142.9	highly influenced by k.
k	49		Irregular (voice-like) vibrations.

Table II
(Reversed Record from Tape)
Sound sequence obtained on play back :
(k) a : ka :

Speech sound	Duration in σ	Frequency of voice	Remarks
(k)	24	Indefinite	very faint disturbance.
	6	166.6	
	6.5	153.8	
	6.5	153.8	
	6.5	153.8	
	6	166.6	
a :	7	142.9	
	6.5	153.8	
	6.5	153.8	
	6.5	153.8	
	7	142.9	
	6.5	153.8	
	7	142.9	
	7	142.9	
	6.5	153.8	
	6.5	153.8	
k	19		Indefinite. k begins almost immediately. It does not consist of the indefinite voice-like pattern as in Direct record.
	72		Silence.
	16		Indefinite.
	7	142.9	
	7.5	133.3	
	7	142.9	
	7.5	133.3	
a :	7.5	133.3	
	8	125	
	7.5	133.3	
	8	125	
	8	125	
	8	125	
	8	125	
	8	125	
	8	125	
	15		Indefinite ?

Table III
(Direct Record from Tape)
Sound sequence uttered : *ka:ka:*

Speech sound	Duration in σ	Frequency of voice	Remarks
k	21.5		Indefinite.
	7.5	133.3	
	8.5	117.7	
	8.5	117.7	
	8.5	117.7	
	8.5	117.7	
a :	8	125	
	8.5	117.7	
	8.5	117.7	
	8	125	
	8	125	
	8	125	
	8	125	
	8	125	
	7.5	133.3	
	45		Indefinite voice-like vibrations.
	45.5		Silence.
k	20		Indefinite.
	7	142.9	
	7.5	133.3	
	7.5	133.3	
	7.5	133.3	
	8	125	
	7	142.9	
	7.5	133.3	
	7	142.9	
a :	7	142.9	
	7	142.9	
	7	142.9	
	7	142.9	
	7	142.9	
	7	142.9	
	7	142.9	
	6.5	153.8	**(continued)**

TABLE III—(*contd.*)

Speech sound	Duration in σ	Frequency of voice	Remarks
	7	142.9	
	7	142.9	
a :	7.5	133.3	
	13.5	74.08	
	20		Indefinite.

Table IV

(Reversed Record from Tape)

Sound sequence obtained on play back

a:*ka*:*k*

Speech sound	Duration in σ	Frequency of voice	Remarks
	12		Undulation with a faint resemblance to *a* :
	13.5	74.08	
	7.5	133.3	
	7	142.9	
	7	142.9	
	6.5	153.8	
	7	142.9	
	7	142.9	
	7	142.9	
a :	7	142.9	
	7	142.9	
	7	142.9	
	7	142.9	
	7.5	133.3	
	7	142.9	
	7.5	133.3	
	7.5	133.3	
	7.5	133.3	
	7.5	133.3	
	7.5	133.3	
	7	142.9	(continued)

TABLE IV—(*contd.*)

Speech sound	Duration in σ	Frequency of voice	Remarks
k	20		Indefinite.
	70		Silence.
	25		Indefinite (voice-like).
	7.5	133.3	
	7.5	133.3	
a:	8	125	
	8	125	
	8	125	
	8	125	
	8.5	117.7	
	8	125	
	8.5	117.7	
	8.5	117.7	
	8	125	
	8.5	117.7	
k	21		Indefinite, faint undulations (not like *k*).

The following Melody Plots have been drawn with the above data.

Part III : Discussion of Results.

These preliminary experiments show that speech is only partially reversible.

The question of the reversibility of speech was examined by us at the (1) phonemic, (2) acoustic, (3) articulatory and (4) psycho-acoustic levels.

It has been found that speech is, in general, phonemically reversible. It is also reversible acoustically by mechanical means ([24a]). But the articulatory process, like any other physiological process reveals itself to be an irreversible process.

When we utter, for example, the phoneme sequence represented by */kākā/*, we find that the acoustical pattern corresponding to it, as revealed by the oscillogram, has the following characteristics, given below in the order of their occurrence during the utterance :

24a. Even the mechanical reversal of the acoustic vibrations seems to be incomplete. There is a kind of hysterisis effect observed during such a reversal.

A sudden non-repetitive oscillation representing the release of the back of the tongue from the palate [k] followed by the building up of the vowel vibrations and by the long vowel-stretch [a:] and its slower falling off, in its turn followed by the voice-(like)-vibrations of a consonantal nature [g] (?), followed by the silent region corresponding to the complete closure of the breath stream and then by the sudden release [k] and the final building up, maintenance and dying off of the vowel [a:]. The acoustical pattern may thus be represented as [ka:gka:].

The phonemically reversed sequence [*ākāk*], however, does not show the characteristic [a:kga:k], as should be expected by a corresponding acoustical reversal, but, on the other hand, it has the characteristic [a:gka:g].

Therefore, any articulatory process attempting the utterance of the phoneme /k/ necessarily was found to result in an actual acoustic pattern [k] in the initial (i.e., pre-vocalic) position and in [g] in the final (i.e., post-vocalic) position. The acoustic pattern in the intervocalic position is always [gk]. This can never be reversed to [kg] in any acoustico-articulatory process as is to be expected from the point of view of the alpha-phonoid theory.

The phoneme sequence /ākāk/ reveals the acoustic patterns [a:gka:g] or [a:gka:gk] according as whether the final /k/ is unreleased or released (i.e., whether the 'final' /k/ is articulatorily post-vocalic or inter-vocalic).[25]

Looking at the problem from the point of view of psycho-acoustics we must note that, in all perception, we are concerned not only with one 'level'—the conscious—but with many, each with its own quality. At the conscious level there is the necessity for a proper Gestalt for good perception—ordering in space and time, implying a space-time continuum. However, at the unconscious level these laws of Gestalt are no more valid and one thinks of the unconscious levels as 'confused', lacking all order in space or time. It is no more an 'ordered set' but a 'discontinuous' ordering. Also, since the conscious time is irreversible —except for what we call memory—time is unidirectional. From this

25. Cf. in this connection Prof. A. Tanakadate., A Study of Japanese Phonemes by means of Tone Films, Proc. Interna. Congr. of Phonetic Sciences (II), 1935, p. 117 ff., wherein he reports that the Japanese word *kuke* when played backwards sounds eku the initial k of the original being lost on reversal. He further says that the 'k' which is heard with the 'e' in the original is now heard with the 'u' on reversal as '*ku*'. But our own observation of the inter-vocalic 'k' seems to show that *Kuke* on reversal should sound something like *e* ^{hl} *ku* the quality of the 'k' being totally altered on reversal.

point of view time in the unconscious is not only reversible but eminently mixable; phenomena in the unconscious seem to overlap for apparently no reason, baffling the conscious.

There is however a third state—that of the aesthesis. Here, experience is not time-bound but free from before and after (of the conscious) and the 'overlapping' (of the unconscious). This region is the alpha-phoneme—which is neither before nor after, nor is it continuous or discontinuous. From this point of view both conscious and unconscious are time-bound—different orderings of time, perhaps, but yet confined to the laws of time in its widest sense.

In the perception of tones—and hence speech—there are these very same aspects observable. A continuous stream of tones as in music or speech is consciously irreversible. That is, reversed speech would sound completely different from direct speech. A process like *ka:ka:* = *a:ka:k* is not possible physically,[26] physiologically or psychologically (consciously). Auditorily the irreversibility makes itself evident in quite a different way. Analysis of the physical characteristic—speech melody and duration—similarly shows the same irreversibility.

Physically the irreversibility can be observed by comparing the records for direct and reversed speech.

(The above results are evident from the tables and graphs.)

Not only is this the case, but sounds which are heard in direct speech are auditorily absent in reversed speech and *vice versa*.[27]

Our normal conscious auditory perception gives us only a very small fragment of the totality of the physical stimulus and the physiolo-

26. Cf. foot note 24a. For the 'ultimate' reversibility, see WEYL, referred to in BDCRI. 12, p. 235.

Cf. also for the question of the reversibility or irreversibility of natural phenomena from the points of view of General Relativity and thermodynamics respectively, C. T. K. Chari, Time a Minkowski's 'Fourth Dimension', Astrological Magazine, Annual Number 1952, pp. 137 ff.

In reversed speech, the final sound, for instance, in /akak/ is *not* heard, i.e., physiologically it is non-existent (that is, auditorily); but in certain states of emotion, for instance, anger physiologically (auditorily) certain sounds like 'y' as in *ayanapoyinara* is heard, but physically it tends to disappear. (Some of these problems form part of a separate disserations respectively by Shri. P. C. Ganeshasundaram and Shri. B. Chaitanya Deva, and are given here only as instances).

These facts confirm that both the acoustic and the articulatory *times* are really different, though they have a common origin in the alpha-phonoid (Cf. C. R. Sankaran, A Contribution to the Study of Speech Structure, BDCRI, Vol. 12, p. 221).

27. Cf. Tanakadate, *Ibid.*

gical receptions that it deals with. At the gross levels, it was noticed for instance that the terminal *k* was not heard when the record *ka*:*k*a:*k* was reversed. Also, ˉ *k* sounds something like —*k*. Finer elements though not perceived by the conscious are perceived by the sub- and unconscious. Pitch variations like vibrato and trills are just below the conscious—perceivable if attended to. But there are finer variations in pitch and duration which are completely missed by the conscious, in spite of the production of these variations.

These finer tonal factors are perceived by the unconscious[28] lending to our conscious tonal experience a sonority and plasticity. But, for biological usefulness, these are repressed. Such a repression is destroyed—and the tone quality of direct speech is also destroyed—on reversing the speech record, because the time-order of perception is destroyed by the reversal.[29]

This would mean that out of what we received from the outside world we organize only a fragment into a perceptual unit calling it a tone (musically) or a vowel or a consonant (in speech). We attribute to this perceptual unit a 'thing-constancy', a 'Gestalt'. We then project this on to a speaker, imagining that he has uttered such and such a sound, when it can be shown to be absent in the physical record.

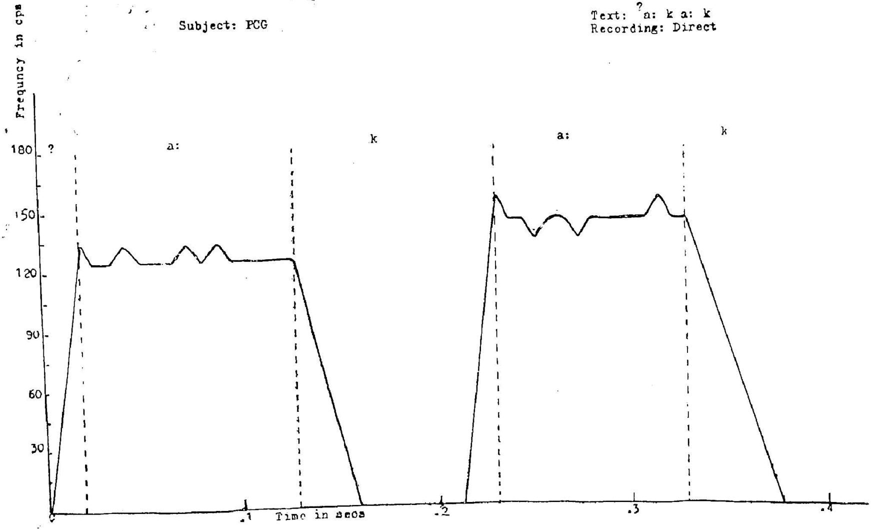
28. Ehrenzweig, A: Psychoanalysis of Artistic Vision and Hearing (Routledge Kegan Paul, 1953).

29. *Ibid.*, p. 99.

Melody Plot I

Subject: PCG

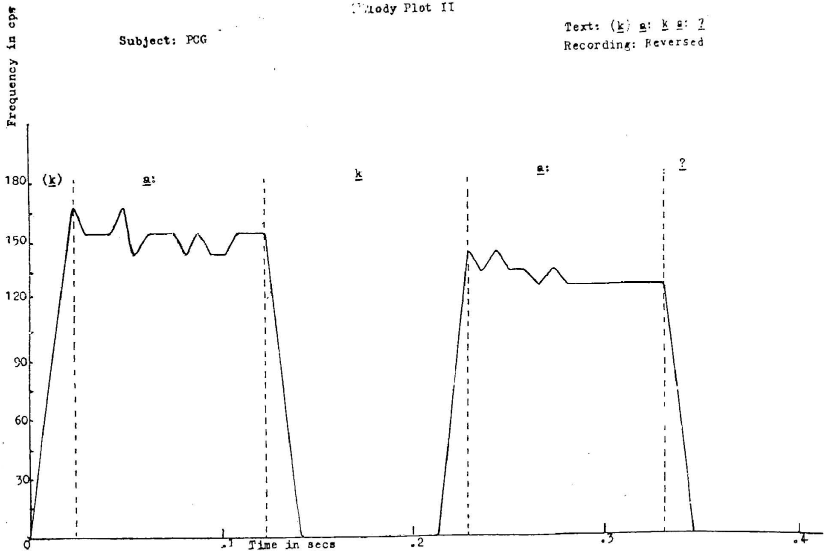
Text: ʔa: k a: k
Recording: Direct



Melody Plot II

Subject: PCG

Text: (k) a: k a: ?
Recording: Reversed



Melody Plot III

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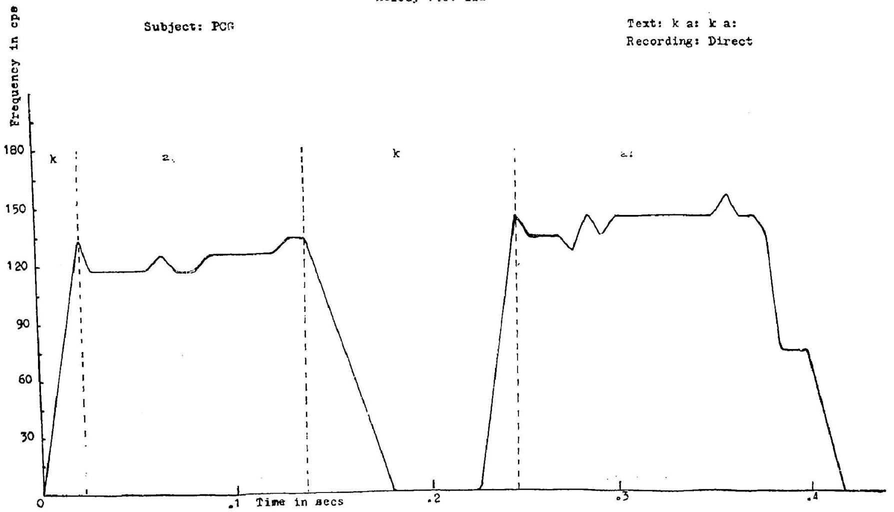

Melody Plot IV

Subject: PCG

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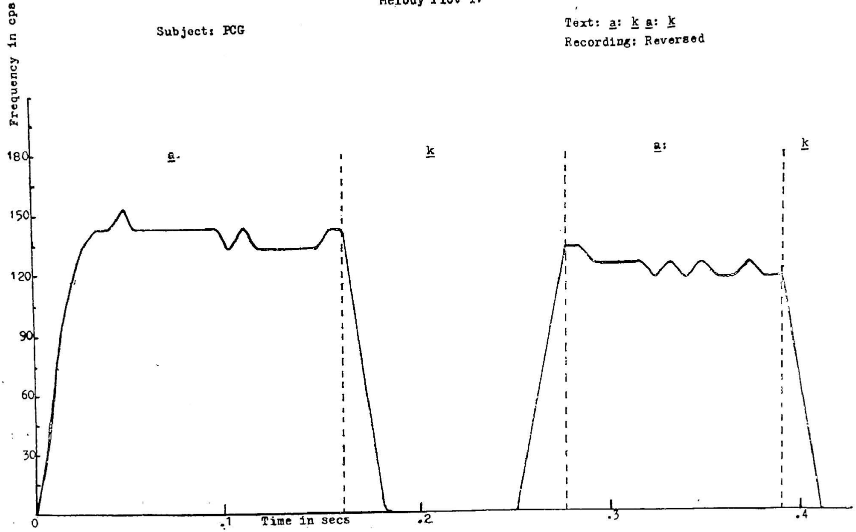
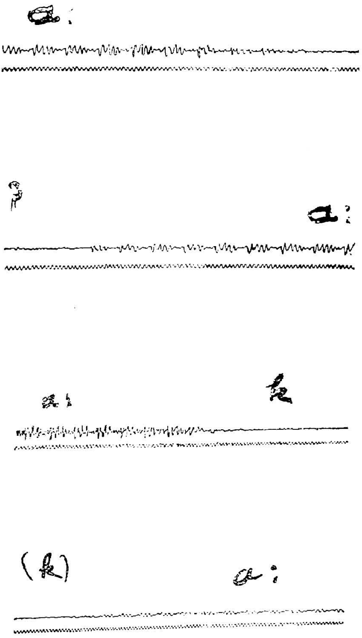
Recording: Reversed





Sample Oscillograms

A NOTE ON HARIKATHA

By

Y. B. DAMLE.

An attempt is made in this note to trace the development of Harikathā or Kīrtan right from antiquity to the present period. Also an attempt is made to analyse the significance of Harikathā or Kīrtan from the structure functional point of view.

Amongst the different paths to salvation recognised by the Hindus, Bhakti-Mārga (the path of Devotion) occupies an important place. It is very difficult to trace the origin of the Bhakti cult in Hinduism since it *'is shrouded in mystery'*.[1] Nevertheless the germs of this cult are to be found in the Vedic hymns and the Upanishads. The development of the cult can be studied by going through the pages of the Mahabharata and the Puranas.

Since God cannot be apprehended by the senses, he *'is attained only through whole-hearted devotion'*.[2] The most important exposition of the doctrine of Bhakti is made by Nārada and Sāndilya. *'Nārada defines bhakti as of the nature of intense love for God.'*[3] Sāndilya defines it as attachment to God. Naturally bhakti is regarded as the 'opposite of hate'. Bhakti or devotion to God should, however, be selfless. Devotion should be both the means and the end. Therefore, *'it is higher than the other means of salvation'*.[4]

Devotion to God does not mean a life of inaction. Social customs and usages aught to be adhered to, surrendering *'all their consequences to God'*.[5] That is why it is felt that the Bhakti Mārga bore a functional relationship to the then prevailing social structure viz. based on fourfold division of society. The only change introduced by adopting the Bhakti Mārga was its being thrown open to all and sundry, irrespective of caste and sex. Since other paths of salvation viz. the Jnāna or knowledge of the Self, and Karma or religious observances were not meant for

1. *The Cultural Heritage of India—Sri Rāmakrishna Centenary Memorial*, Vol. II, p. 48.
2. *Ibid.*, p. 49.
3. *Ibid.*, p. 50.
4. *Ibid.*, p. 63.
5. *Ibid.*, p. 56.

all the emergence of devotion as a path must be interpreted as a major concession made to the deprived classes of people. Nevertheless it should also be borne in mind that as such it also helped to retain the structural pattern. It is felt that this aspect properly falls under the category of '*manifest function*' (of Bhakti) as it has been defined by Merton.[6]

Nārada exhorts people to listen to and sing the attributes of God in the company of the devotees. Hearing, singing, remembrance, salutation, worship, prayer, servitude, friendship and self-dedication are the nine characteristics of devotion.[7]

Harikathā or Kīrtan is based on the second characteristic, viz. singing. The literal meaning of the word Harikathā or Hari-Sankīrtana is the devotional singing of anecdotes of Lord Vishnu. Though this was the most important aspect of Harikathā, other aspects were mingled too. Thus the effort to mould peoples' character by telling tales of the heroic deeds of the Gods became also a '*manifest function*' of the Harikathā. So also the carrying on the glorious traditions to posterity was one of the '*manifest functions*'. Harikathā can thus be regarded as a powerful cultural transmitting agency in the absence of printing. The word of the mouth had immense potency.

This tradition of Harikirtan is very old and is traced to Nārada. Nārada is said to be the originator of this tradition. In the Padma Purāna there is a verse which describes the participants in Harikathā. Thus Pralhāda (the son of Hiranyakashipu, a demon) is described to be engaged in keeping the rhythm, Nārada is holding the Veena (a stringed instrument), Arjuna is singing, Indra is playing the drum and all are singing the praise of Lord Vishnu.

The tradition spread from north to south. '*One of the best institutions of the (bhakti) movement is called Harikathā, a sort of sermon in song which the leader opens by shouting, Jai Rām-Krishna Hari. This method of mingled song is found in the south also, where the singer is called Bhagvata and the musical sermon is called Kālakshepam.*'[8]

Some of the important leaders intellectual and spiritual, have been responsible for giving Harikathā its present shape. In the South during the seventh and the tenth century there was a succession of Tamil Vaishnava poet singers known as Alvārs. They taught outcastes and some of them were outcastes themselves.[9] Their poems reflected the in-

6. *R. K. Merton—'Social Theory and Social Structure'* p. 51.
7. Bhāgavata, VII. 5. 18.
8. *'Outline of the Religious Literature of India'*—by J. N. Farquhar, p. 302.
9. *Op. cit.*, p. 187.

fluence of epics and early purans. In Maharashtra the names of the following saint poets—Jnāne-svara (c. 1290), Nāmdev (c. 1425), Bhānudas (c. 1540), Eknāth (c. 1608), Tukārām (c. 1608-49), Rāmdās (c. 1608-81) and Sridhar (c. 1679-1728) are linked up with Harikathā. In the north Rāmānanda (c. 1400-70), who strove to effect Hindu-Muslim synthesis, Kabir (c. 1440-1518), who tried his best to do away with caste distinctions and idolatry, Nānak (c. 1469-1538), who built a new sect synthesising the best elements of Hinduism and Islam were actively connected with the movement. In the Karnatak Purandar Dās, disciple of Vyāsa Rāja (16th century A.D.), was responsible for the development of Harikathā.

Regional diversities apart, there have been some essential common features of Harikathā. Thus singing, exhortation and an effort to pass on the ancient heritage have remained common features of Harikathā throughout India. Likewise certain exigencies like political and religious pressure have given Harikathā a special form which can be amply observed in Maharashtra.

Thus there is no doubt that new 'manifest functions' have been added to Harikathā in order to cope up with the changing structure. The liberalising of the attitute towards the outcastes helped a good deal in strenghtening the Hindu structure to withstand the onslaughts of Islām both political and religious. Otherwise there was every possibility of large scale conversions of the Hindu masses to Islām, which accepted the principle of essential equality of all human beings. Besides the 'structural constraints' arising out of the Muslim domination left very limited opportunities for Hinduism to thrive.[10] Harikathā provided the much needed platform for exhorting both the classes and the masses. Shivāji (the Maratha King) is reported to have attached considerable significance to Harikathā. In fact he is reported to have performed Harikathā himself.[11] Saint poets throughout India used Harikathā as the medium for welding the people together who were separated from each other by caste divisions by inculcating noble traditions embodied in the epics. Epics were sought to be reinterpreted in the light of the prevailing conditions. Thus Krishna's fight against Kansa was interpreted as fight against tyranny and injustice. And the people were exhorted to follow the noble example of Krishna in their fight against any form of tyranny and injustice whether political or religious. Harikathā was used to rouse the people of all classes to suitable action within '*structural constraints*'. In the struggle for national independence too

10. *Op. cit.*, Merton—p. 53.
11. Mahārāshtriya Jnānakosha—'Kīrtan'—Vol. II, p. 514.

Harikathā was used as a very effective platform for indoctrinating the masses. Even economic movements like the Swadeshi movement (ban on foreign goods) were preached through the Harikathā. Small wonder then that the British Government in India issued orders for arresting Kathākārs who indulged in this sort of propaganda.

Though Harikathā is performed in all parts of India it has had some special features in Maharashtra. Harikathā was sought to be systematised in Maharashtra. Several instructions have been evolved to make it effective. So many qualities like truthfulness, contentedness, excellent moral character, capacity to sing and narrate in an effective manner, repartee and ready wittedness, rhetoric, etc., are enjoined upon a person who wants to be a good Kathākār.[12] Harikathā can be properly regarded as a one actor play. The Kathākār has to assume different roles in quick succession. Not only that he should be well versed in the epics and classical literature but he must be adequately conversant with current philosophical doctrines, current history, social and political events, grammar, theological literature pertaining to other faiths than Hinduism so that he can effectively educate the people.[13] With a view to ensure possession of these qualities regular schools were started to provide instruction in the same. In Poona the society for the promotion of Hari-Kīrtan has been running a School for the last fourteen years to impart instruction to the would be Kathākār, both males and females.[14] Regular courses are given at the end of which the candidates are duly examined and are awarded certificates.

Harikathā occupies an important place in Maharashtra today as an educational and entertaining agency which effectively caters to all the layers of society, is highly organized and quite a few well-educated persons (e.g. College professors) have devoted themselves to the task. Some of the chiefs of the States e.g. of Aundh and Miraj were themselves very able Kathākārs and have published their Kīrtans. They were active patrons of Harikathā. Some of the modern Kathākārs style themselves as National Kīrtankārs.

'Manifest functions' are added to Harikathā. None should be surprised if mention is made of the Five Year Plan, Development Projects, National Savings Campaign, Literacy Campaign in the Harikathā of today in Maharashtra. The themes of Harikathā are written out and published, giving detailed instructions about the sequence, number of songs

12. *Ibid.*, p. 514.
13. *Ibid.*, p. 514.
14. *A short account of the School for imparting instruction in Hari-Kīrtan*, Poona.

etc. It is usually divided into two parts called the Purvaranga and the Uttararanaga. The first part consists of prayer to the Lord and second part consists of some theme from the epics or the Purānās or even from history both past and recent e.g. the theme of Shivāji's life and work or that of Rani (Queen) Laxmibai of Jhānsi or even Subhāsh Chandra Bose.

The foregoing analysis clearly reveals the need for an empirical study of Harikathā in order that its significance can be properly assessed. Likewise application of the structure-functional approach will enable a clearer understanding of the structural changes that have come about and the need for discarding *'dysfunctional'*[15] elements or for adding *'manifest functions'*. It is felt that Harikathā has by no means become *'dysfunctional'*. On the other hand it has already been indicated how there has been a significant addition to its *'manifest functions'*.

Post Script—After this note was ready some more valuable material was made available by the kind help of Pandit Siddheshwar Shāstri Chitrāv which is recorded here. The author is grateful to the above said person for the very valuable communication he had with him in regard to the topic.

The gist of the material is as follows :

In Maharashtra there is a class of beggars known as Chitrakathī—those who describe the pictures. These Chitrakathī beggars carry with them pictures of different gods and deities and they show these pictures one by one to the public and narrate the relevant episode in relation to gods and deities. Singing is also resorted to while trying to narrate the episodes in a dramatic manner. Actually these Chitrakathī are known according to the pictures of gods and deities that are exhibited by them. Pānini the famous Grammarian has mentioned Chitrakathī beggars. *'Those who wander from house to house begging, carrying pictures and telling anecdotes are called as such' (Chitrakathī)—Pāninī—Tattvabodhini Sutra* 5.3.99, p. 303, *old edition.* It is indeed significant that they are mentioned as long ago as 500 B.C. They are like non-Brahmin beggars. And it is surmised that they were the forerunners of Kathākārs.

Even today there are many famous non-Brahmin Kathākārs like Sant Tukdoji Mahārāj. It will indeed be a fascinating study to trace the adoption of the profession of Kīrtan by Brāhmins. It would reveal very many changes to which social structure was subject and the attempts made to cope up with them by adding suitable functions.

15. *Op. cit,* Merton—p. 51.

ŚAṄKARA AND VYĀSA ON THE THEORY OF KARMA *

By

H. G. NARAHARI

I. *Śaṅkara*

It is the Upaniṣadic *pitṛyāṇa,* the doctrine of the soul travelling by the way of the fathers to reach the Moon staying there only as long as its deeds permit (*yāvat sampātam uṣitvā*)[1] and returning to earth the moment this store of merit is exhausted, that is reiterated by Bādarāyaṇa in his aphorism[2] *Kṛtātyaye' nuśayavān dṛṣṭasmṛtibhyām yathetamanevaṁ ca.*

Now, the question arises which is the factor that brings about the return of the soul to earth since this remains in the lunar world till its deeds permitting that privilege are still operative and existent, and has to return only when this store of deeds is exhausted? As the Brahmasūtra cited above would have it, there is a remnant of deeds still sticking on to the soul which brings it back to this world when it can stay no longer in the lunar region. But according to the Upaniṣadic statement the soul stays in the Moon till its deeds are extinguished. Where then is the remnant which can bring about the downward journey of the soul? It is this problem that Śaṅkara tries to answer in the course of his commentary on the Brahmasūtra under discussion.

It is true that, in two places[3] at least the *Bṛ. Up.* speaks of the exhaustion of the soul's deeds in the lunar world, but the collection of deeds (*karmavṛnda*) mentioned here is only that by which the souls could ascend to the Moon for enjoyment and assume also a watery body necessary for such an enjoyment. The exhaustion of these deeds marks also the extinction of the watery body which cannot bear the grief arising thereby. Its disappearance is as certain as of the iceberg melting at the contact of the rays of the Sun, of hard ghee melting through proximity with fire:[4]

* Paper submitted for the *Indian Philosophical Congress,* Delhi, 1946.

1. *Ch. Up.,* V. 10.5; the *Bṛ. Up.* (VI. 2.16) means the same thing when it speaks of the soul in the state of food being eaten up by the gods in the lunar world.
2. *Brahmasūtra,* III. 1. 8.
3. VI. 2. 16; IV. 4. 6.
4. Śaṅkara's *bhāṣya* on Brahmasūtra III. 1. 8. (Nirnayasagara Press edition, Bombay, 1917), p. 667.

येन कर्मवृन्देन चन्द्रमसमारूढाः फलोपभोगाय तस्मिन्नुपभोगेन क्षयिते तेषां यदम्मयं शरीरं चन्द्रमस्युपभोगायारब्धं तदुपभोगक्षयदर्शनशोकाग्निसंपर्कात्प्रविलीयते। सवितृकिरणसंपर्कादिव हिमकरकाः। हुतभुगर्चिःसंपर्कादिव च घृतकाठिन्यम् ॥

The existence of a remainder of deeds (*anuśaya*) is asserted both by Śruti and Smṛti. The *Ch. Up.*[5] which speaks of high and low birth on earth, according to conduct (*caraṇa*), of the soul returning from the Moon, definitely assumes the existence of such a remainder and refers to it by the word *caraṇa*.[6] The same view is reiterated in the Smṛti:[7]

वर्णा आश्रमाश्च स्वकर्मनिष्ठाः प्रेत्य कर्मफलमनुभूय ततः शेषेण विशिष्टदेशजातिकुलरूपायुः श्रुतवृत्तवित्तसुखमेधसो जन्म प्रतिपद्यन्ते ॥

Considering the nature of this 'remainder', some would have it as what remains of deeds performed for the sake of the heavenly world the greater part of the fruits of which have already been enjoyed, a remainder comparable to the oil sticking to the inside of a vessel, full of oil, even after it has been emptied:[8]

स्वर्गार्थस्य कर्मणो भुक्तफलस्यावशेषः कश्चिदनुशयो नाम भाण्डानुसारिस्नेहवत्। यथा हि स्नेहभाण्डं रिच्यमानं न सर्वात्मना रिच्यते भाण्डानुसार्येव कश्चित्स्नेहशेषोऽवतिष्ठते तथाऽनुशयोऽपीति ॥

Such a view is untenable because it contradicts two accepted doctrines; first, that the deeds performed for achieving the Moon-world operate no more after their fruition and that entering this world only is the fruit of such deeds; and second, that the 'remainder' of all souls is not the same, that it is good in some cases and bad in others. If any remnant were possible of the deeds whose fruit is heaven, it should uniformly be, in the case of every soul, good in nature. But the Ch. Up.[9] speaks of two varieties of this remainder, good and bad, and suitable rebirth as a consequence. It is therefore necessary to understand that the souls go to the Moon and exhaust there only that portion of their deeds whose fruit belongs to that world and is begun to be enjoyed there (*yat kiñcid iha kṛtam āmuṣmikaphalaṁ karmārabdhabhogaṁ tat sarvaṁ phalopabhogena kṣapayitvā*), and redescend to earth once those deeds are exhausted.

5. V. 10.7.
6. According to Brahmasūtra III.1. 9, this is the view of Kārṣṇājini.
7. cited by Śaṅkara, *loc. cit.*
8. Śaṅkara, *op. cit.*, p. 669.
9. *loc. cit.*
10. Śaṅkara, *op. cit.*, p. 670.

It is wrong to think that death manifests all the deeds of the man, even those whose fruition could not begin on earth. If, in life, certain deeds could not operate because others which had already begun fruition did not allow them the opportunity, it cannot mean that the necessary facilities will come after death. Even then it is possible that deeds of less intensity will be overpowered by those of stronger force. Moreover different deeds whose fruits ought to be experienced in different existences cannot all manifest themselves on the occasion of one death or bring about only one existence. Deeds are different in nature, and some are even mutually opposite in character. The latter at least cannot operate together. It is impossible to say even that only some deeds manifest themselves at death while others are extinguished. That would be to contradict the established rule that all deeds have fruits and can be extinguished only under exceptional circumstances such as performance of expiations. There is the testimony of Smṛti to prove that deeds do last for a long time even after they are obstructed. Further, if all unrequited deeds should bring about a single existence, one born in heaven or hell or as an animal can, not being so entitled, perform no religious deed and will consequently find liberation impossible. But such an eventuality is opposed to the doctrine laid down in the *Smṛti* according to which some single actions like murdering a brahmin bring more than one existence. There are besides certain deeds like the *kārīrī* sacrifice whose fruits are enjoyable only in life and before death. All the deeds of the man cannot therefore manifest themselves at the time of his death which circumstance, however, provokes the operation of the stronger among them, though the fact remains that, as unrequited deeds, these are given only as much opportunity as the weaker ones:[11]

आरब्धफलेन कर्मणा प्रतिबद्धस्येतरस्य वृत्त्युद्भवानुपपत्तेस्तदुपशमात्प्रायणकाले वृत्त्युद्भवो भवतीति यद्युच्येत । ततो वक्तव्यम् । यथैव तर्हि प्राक् प्रायणादारब्धफलेन कर्मणाऽप्रतिबद्धस्येतरस्य वृत्त्युद्भवानुपपत्तिरित्येवं प्रायणकालेऽपि विरुद्धफलस्यानेकस्य कर्मणो युगपत्फलारम्भासंभवाद्बलवता प्रतिबद्धस्य दुर्बलस्य वृत्त्युद्भवानुपपत्तिरिति । न ह्यनारब्धफलत्वसामान्येन जात्यन्तरोपभोग्यफलमप्यनेकं कर्मैकस्मिन्प्रायणे युगपदभिव्यक्तं सदेकां जातिमारभत इति शक्यं वक्तुम् ; प्रतिनियतफलत्वविरोधात् । नापि कस्यचित्कर्मणः प्रायणेऽभिव्यक्तिः कस्यचिदुच्छेद इति शक्यते वक्तुम्; ऐकान्तिकफलत्वविरोधात् । न हि प्रायश्चित्तादिभिर्हेतुभिर्विना कर्मणामुच्छेदः संभाव्यते । स्मृतिरपि विरुद्धफलेन कर्मणा प्रतिबद्धस्य कर्मान्तरस्य चिरमवस्थानं दर्शयति—

‘ कदाचित्सुकृतं कर्म कूटस्थमिह तिष्ठति ।
मज्जमानस्य संसारे यावद्दुःखाद्विमुच्यते ॥ ’

11. Sankara, *op. cit.*, p. 670.

इत्येवंजातीयका। यदि च कृत्स्नमनारब्धफलं कर्मैकस्मिन्प्रायणेऽभिव्यक्तं सदेकां जातिमारभेत ततः स्वर्गनरकतिर्यग्योनिष्वधिकारानवगमाद्धर्माधर्मानुत्पत्तौ निमित्ताभावान्नोत्तरा जातिरुपपद्येत। ब्रह्महत्यादीनां चैकैकस्य कर्मणोऽनेकजन्मनिमित्तत्वं स्मर्यमाणमुपरुध्येत। न च धर्माधर्मयोः स्वरूपफलसाधनादि समधिगमे शास्त्रादतिरिक्तं कारणं शक्यं संभावयितुम्। न च दृष्टफलस्य कर्मणः कारीर्यादेः प्रायणमभिव्यञ्जकं संभवतीत्यव्यापिकाऽपीयं प्रायणस्याभिव्यञ्जकत्वकल्पना। प्रदीपोपन्यासोऽपि कर्मबलाबलप्रदर्शनेनैव प्रतिनीतः। स्थूलसूक्ष्मरूपाभिव्यक्त्यनभिव्यक्तिवच्चेदं द्रष्टव्यम्। यथाहि प्रदीपः समानेऽपि संनिधाने स्थूलं रूपमभिव्यनक्ति न सूक्ष्मम्। एवं प्रायणं समानेऽप्यनारब्धफलस्य कर्मजातस्य प्राप्तावसरत्वे बलवतः कर्मणो वृत्तिमुद्भावयति न दुर्बलस्येति। तस्माच्छ्रुतिस्मृतिन्यायविरोधादश्लिष्टोऽयमशेषकर्माभिव्यक्त्यभ्युपगमः ॥

At the time of final release, at any rate, when the soul is in possession of the highest knowledge, all deeds whatever are destroyed wholesale (*samyagdarśanād aśeṣakarmakṣayaḥ*).[12]

Speaking of the Upaniṣadic account[13] of the doctrine of transmigration, Deussen[14] feels that it "teaches a double retribution, once by reward and punishment in the other world, and again by rebirth upon earth. This feature is evidently primitive, and is nothing more than a combination of the traditional future recompense found in the Veda with the novel recompense of the transmigration doctrine." It is easy to see now, in the light of Śaṅkara's explanation, how mistaken an estimate this is of the Upaniṣadic passage.

II. Vyāsa

According to the teaching of the Yoga system, one of the primary duties of the aspirant for the path is the complete annihilation of the five fold hindrances (*kleśāḥ*)[15] which prevent his spiritual elevation. It is in these hindrances that the latent-deposit of Karma takes its root (*kleśamūlaḥ karmāśayo dṛṣṭādṛṣṭajanmavedanīyaḥ*)[16] and as long as the root of this Karma persists to exist, there will be birth for the individual, a certain duration of life, and varieties of experience (*satimūle tadvipāko jātyāyurbhogāḥ*).[17]

12. Śaṅkara, *loc. cit.*
13. *Ch. Up.*, V. 3 ff.; *Bṛ. Up.*, VI. 2 ff.
14. *Phil. Up.*, p. 329, 334.
15. These are enumerated in *Yogasūtra* (II. 3) which runs: ***avidyāsmitā-rāgadveṣābhiniveśāḥ kleśāḥ***.
16. *Yogasūtra*, II. 12.
17. *Yogasūtra*, II. 13.

Concerning this threefold fruition, at least four alternatives appear before the enquiring mind. It can be asked, first, whether one Karma is the cause of one birth, or gives the impulse to more than one birth (*kiṁ ekaṁ karmaikasya janmanaḥ kāraṇam athaikaṁ karmānekaṁ janmā'kṣipatīti*).[18] The query may also be whether more than one Karma projects more than one birth, or a single birth only (*kiṁ anekaṁ karmānekaṁ janma nirvartayati athānekaṁ karmaikaṁ janma nirvartayatīti*).[19]

Now, it is an accepted fact that each individual has to reap the consequences, not only of his present Karma, but also of the huge store of Karma remaining over, accumulated from times immemorial. If only one out of these numerous deeds should have its fruition in bringing about a single birth, the individual will be at a loss to know when it is that he can be free from the heavy burden of his remaining deeds. Such a doubt will bring great harm to the individual, and this is not desirable.[20] It is therefore impossible to accept the first alternative. So also it is absurd to think that a single Karma can bring about more than one birth. That would be to inflict on the remaining deeds a lack of time for their fruition. And, since it is impossible to think of more than one birth at the same time,[21] the third alternative of more than one Karma bringing about more than one birth is also untenable. Only the last of these represents the true state of affairs. Two different groups can be made in the latent-deposit of the deeds of man, good or bad, into those that are subordinate (*upasarjana*) and those that are dominant (*pradhāna*). It is the latter group that brings the next birth.[22] The length of this birth as well as the experience (*bhoga*) of the individual then are also determined by the same agency. It is such a deed that is spoken of as having a threefold fruition (*karmāśayo janmāyurbhogahetutvāt trivipāko' bhidhīyata iti*).[23] There is, however, no general rule that each of these deeds should have a threefold fruition; there may be deeds which bring about experience (*bhoga*) and nothing else; and there may be some others which are the source of longevity besides and thus originate *two* fruitions.[24] Nahuṣa, King of the Gods, had to suffer the condition of an animal. And Nandīśvara could give up his human form in exchange for the

18. *Vyāsa's Bhāṣya* on the above *sūtra*, p. 69 (Ānandāśrama Edn., Poona, 1919).
19. *Ibid.*
20. *Ibid.*
21. *Ibid.*, p. 70.
22. Vyāsa, *loc. cit.*, cf. Śaṅkara, *supra.*
23. *Ibid.*
24. *Ibid.*, p. 70 f.

divine eight years before his time. Nahuṣa's length of life had already been determined by the Karma which brought him the position of Indra, but when he struck Agastya with his heel, the demerit so born brought only a change of experience to him. Nahuṣa thus presents the arena for the single fruition of a deed. The case of the youth Nandīśvara is different. His rigorous penance shortened his mundane stay by eight years and transformed him into a divinity. Here is the instance of a deed which has a double fruition in that it determines both the span of life as also the variety of experience.[25] But both these instances pertain to deeds which proceed from hymns (*mantra*), or penance (*tapas*)[26] or concentration (*samādhi*), or are 'perfected by the worship of the Īśvara (or) of a deity (or) of a sage (or) magnanimous beings,'[27] which are thus of keen intensity (*tīvrasaṁvega*) and which therefore, produce a result which can be felt in the same life (*dṛṣṭajanmavedanīya*).[28]

From this latent-deposit of Karma must certainly be distinguished the subconscious impressions (*vāsanāḥ*) which are no other than the subliminal impressions which produce memory (*ye saṁskārās smṛtihetavas te vāsanāḥ*).[29] These exist from time-without-beginning (*anādikāla*) and are not limited to one existence (*anekabhavapūrvikāḥ*).[30]

Also, it is not every deed that is limited to one existence. The limit applies only to those whose fruition takes place in the same life. Those that fructify in a further birth (*adṛṣṭajanmavedanīya*) and whose fruition is now undeterminable (*aniyatavipāka*) have no such limit.[31] At the time of death, it is not the entire deposit of Karma that has the chance of fruition. Only the dominant part of it is made manifest then. The remaining portion is either annihilated, or merged, or even kept in subordination till such time when it becomes capable of fruition.[32] If this unmanifested deed is unripe, it is destroyed (*kṛtasyāvipakvasya nāśaḥ*).[33] There is, for instance, the belief that the effect of evil deeds is obliterated by the performance of meritorious acts (*śuklakarmodayād ihaiva nāśaḥ*

25. Vyāsa and Vācaspati on *Yogasūtras*, II. 12-13.
26. J. H. Woods (*Yoga System of Patanjali*, Harvard Oriental Series, No. 17, Cambridge, Mass., 1914, p. 121) takes the words *mantra* and *tapas* to mean respectively 'sacrificial formulae' and 'self-castigation'. I do not feel that these are happy renderings of the original words.
27. J. H. Woods, *Ibid.*
28. Vyāsa on *Yogasūtra*, II. 12, p. 68.
29. Vyāsa, *op. cit.*, p. 71.
30. *Ibid.*
31. *Ibid.*
32. *Ibid.*, pp. 71-73.
33. *Ibid.*, p. 71.

kṛṣṇasya).[34] In illustration of the principle that the unmanifested deed can be merged into the dominant deed which has fructified, it is pointed out that the slight guilt that may accrue by the performance of a sacrifice cannot remove the merit won thereby (*syāt svalpaḥ saṅkaraḥ saparihāraḥ sapratyavamarśaḥ kuśalasya nāpakarṣāyālam*).[35] Killing is, no doubt, a crime by itself; but if this act is done by the individual as an accessory (*aṅga*) to a sacrifice like *Jyotiṣṭoma*, he is not guilty.[36] If, however, this subject Karma is more powerful, there is the third alternative that it should wait for its own opportunity in future when it can yield its result (*ciramapy upāsīta yāvat samānam karmābhivyañjakaṁ nimittam asya na vipākābhimukhaṁ karotīti*).[37]. But it must be confessed that it is impossible to determine the place or the time or the cause of the fruition of a Karma. The ways of Karma are really mysterious and impossible to understand (*tad vipākasyaiva deśakālanimittānavadhāraṇād iyaṁ karmagatiś citrā durvijñānā ca*).[38]

34. *Ibid.*, p. 71 f.
35. *Ibid.*, p. 72.
36. Vācaspati on *Yogasūtra*, II. 13, p. 72 f.
37. *Ibid.*
38. *Ibid.*

SOME MATHEMATICAL APPROACHES TO THE ELECTRO-ACOUSTICAL ANALYSIS OF SPEECH-SOUNDS *

By P. C. GANESHSUNDARAM

[This paper deals with the various theories about the structure of speech-sounds and the methods of their analysis viewed from the point of view of the perspectives opened by Prof. C. R. SANKARAN's Alpha-phonoid theory.

Further extension of the work in accordance with the changed perspectives is briefly indicated.]

I. Introduction : It is as yet premature to talk on this subject, since we are still only at the preliminary stages of the problem and have very few positive results to offer.

But in pure fundamental research it often so happens that no positive results come forth to satisfy our legitimate curiosity. However, what is of fundamental importance is not so much the *results* as the *methods* that are adopted or evolved in the studies that are undertaken.

We, at the Phonetics Laboratory, are inquiring into the fundamental nature of speech-sounds. Under "speech-sounds" we include also all acoustic vibration phenomena, although our attention is mainly concentrated on actual speech-sounds properly so called.[1]

II. The Empirical and Inductive Approaches to the Problem of Speech-structure : The systematic scientific study of speech-sounds and musical tones in the modern world can be ascribed to H. von HELMHOLTZ. He observed the regular periodicity of the vowel vibrations and musical tones as against the consonant vibrations. Vowel sounds have, therefore, come to be regarded as musical sounds and consonants as noises.

But, whether they are musical sounds or noises, we are interested chiefly in the description of their fundamental nature. HELMHOLTZ contended that the vowels were produced by resonance in the vocal cavities,

*Being a talk delivered under the auspices of the Mathematical Association, Poona, at the Physics Lecture Hall of the Fergusson College, Poona, on the 22nd January 1953, giving a brief sketch of the type of work attempted at the Phonetics Laboratory, Deccan College Research Institute, Poona, under, the inspiring guidance of Prof. C. R. SANKARAN and the happy collaboration of Messrs. B. CHAITANYA DEVA, A. D. TASKAR, V. R. PATWARDHAN and others.

1. Cf. C. R. SANKARAN and P. C. GANESHSUNDARAM : Time and Speech-structure, BDCRI, vol. 12, pp. 394-414; also P. C. GANESHSUNDARAM : A Qualitative Definition of the Perfect Vowel and the Perfect Consonant, BDCRI (elsewhere in this issue).

so that the natural frequencies of the vocal cavities were responsible for the resulting complex vowel sounds.

It was found, however, by HERMANN to be inadequate to describe vowel sounds in such simple terms. He formulated the theory of the so-called "formants". Vowels, irrespective of the pitch of the voice of the speaker, tend to be concentrated in two frequency regions that are unique for each vowel. These frequency regions are called the two formants of the vowels, respectively the lower and the higher formants or formant 1 and formant 2. The vowel 'I' has the greatest value for the higher formant, and the vowel 'U' has the lowest value for the higher formant. The higher formants of other vowels lie in between these two extreme values.[2]

The formants can be determined only empirically and they do not tell us anything about the fundamental nature of speech-sounds in which we are interested. This is a serious drawback of the formant theory. The frequency regions of the formants are never quite definitely defined in terms of the component frequencies in precise positive terms.[3]

The formant theory attributes the two formants respectively to the resonance in the front and the back cavities of the mouth. This theory, therefore, is essentially a resonance theory like the one formulated by HELMHOLTZ with this only difference, namely, that the two formants are attributed to the resonance of the two parts of the vocal cavity.

But it has been repeatedly found that there are more than two such formants, and, therefore, to attribute each formant to the resonance in a separate cavity conclusively proves to be inaccurate.

Further, E. W. SCRIPTURE's experiments in filtering out the formant frequencies showed that the vowel character did not change when the formants were removed. Whatever change there was, was only in the musical quality of the vowel. This obviously implies that the mere determination of the formants is not sufficient to specify a vowel sound fully. After a careful scrutiny of the film tracks of vowels, he sug-

2. Vide Pierre DELATTRE, The Physiological Interpretations of Sound Spectrograms, PMLA, vol. 66, No. 5, pp. 864-875.

3. The derivation of mathematical expressions for the formant frequencies in terms of the component frequencies in vowel sounds is being attempted by the present author and the results, it is hoped, will form the basis of a forthcoming paper. See also P. C. GANESHSUNDARAM, The Structure of Speech-sounds, BDCRI, [elsewhere in this issue]. Cf., too, foot note 28 of the present paper, and P. C. GANESHSUNDARAM, A Qualitative Definition of the Perfect Vowel and the Perfect Consonant, op. cit.; also, C. R. SANKARAN and P. C. GANESHSUNDARAM, Time and Speech-Structure, BDCRI, vol. 12, pp. 394-414.

gested that instead of the vowel sound being due to the excitation of the resonance (or natural) frequencies of the cavities by a continuous vocal chord tone, there is an excitation of the transient frequencies of the cavities by a series of "puffs" emanating from the vocal chords.

SCRIPTURE summed up his theory in describing the vowel sounds as a closely following series of what he called vowel "profiles". Each profile is a decremental sinusoidal function. The form of the function for a particular vowel remains the same from profile to profile but the actual parameters may be changing even within a single vowel as we proceed from profile to profile.[4]

A. GEMELLI, of Milan, like SCRIPTURE, also found that Fourier analysis on vowel sounds does not give even an approximate picture of the vowel and that the inharmonic components are often more prominent than the harmonic ones. He, therefore, used the mathematical tool of *Vercelli Analysis*, which reveals many inharmonic components.

At the same time the physiological investigators like G. Oscar RUSSELL and others, making X-ray studies on the vocal cavities, found that the dimensions of the cavities play a very minor part and what they call the 'articulation place' is more important in comparison.

The position, therefore, is one, wherein, viewing the question from various angles, these workers have come to apparently contradictory conclusions.

The difference between HELMHOLTZ-HERMANN resonance and formant theories on the one hand and SCRIPTURE's "puff" theory on the other, is that in the former the exciting stream of sound waves (i.e. vocal chord tone) is taken to be continuous, whereas in the latter it is taken to be in the nature of a series of "puffs" sent out through the vocal chords intermittently, at the frequency of the vocal chord tone. But the point in common between these two view-points is that the natural frequencies of the resonance cavities are excited, giving rise to a complex sound of sinusoidal components in the one case, and to a complex sound of a series of decremental sinusoidal components in the other.

These theories imply that the vocal chords act only as an exciting agent for exciting the natural frequencies of the vocal cavities.

The physiological investigations of Oscar RUSSELL and others have shown, however, that with the same dimensions of the cavities different

4. Cf. C. R. SANKARAN, *Phonemics of Old Tamil, Deccan College Monograph Series*, No. 7, 1951, pp. 25-28.

vowels can be produced, or conversely, the same vowel can be produced with different dimensions of the cavities. Thus it is what they call the 'articulation place' that is more important than the dimensions of the cavities. But the physiological investigators, in their turn, have shown an increasing tendency to ignore in their work the actual importance of the dimensions of the cavities, especially as is reflected in the latest work of Pierre DELATTRE.[5]

The question then remains as to 'what then the vocal chords do?' and 'how does the "articulation place" play its part?' We shall come back to this a little later.

The Japanese scientist, TANAKADATE, observed that at least a minimum of 3 'profiles' in the language of Scripture are required to give a vowel its character. He has also found that in a film record of a consonant-vowel configuration, the amplitude falls to a minimum in the region between the consonant and the vowel.[6]

But no precision instrument and no experiment, however, carefully carried out, have ever shown as to where the consonant ends and where the vowel begins. The change-point can, therefore, not be determined on purely physico-physiological grounds.

The theories of HELMHOLTZ, HERMANN, SCRIPTURE and GEMELLI have not considered this aspect of the problem, which, as it were, raises such fundamental questions as the nature of continuity and discontinuity.

III. The Hypothetico-deductive Approach to the Problem of Speech-Structure :

It is here that Prof. SANKARAN puts forward his geometrical-physical theory of the *alpha-phoneme*.[7]

SANKARAN's theory is based on two simple fundamental assumptions, viz.,

(1) that the consonant and the vowel must be capable of precise positive definition in mathematical terms.

(2) that the consonant and the vowel are mutually exclusive only on arbitrary grounds.

5. Cf. foot note 2.

6. A. TANAKADATE, A Study of Japanese Phonemes by Means of Tone Films. *Proc. II Interna. Congr. Phonetic Sciences*, 1936, pp. 117-122.

7. C. R. SANKARAN and P. C. GANESHSUNDARAM, op. cit.; see also C. R. SANKARAN, A Contribution to the Study of Speech- Structure, BDCRI, vol. 12, pp. 217-247.

Before the advent of Prof. SANKARAN's theory, the assumption of absolute distinction between consonants and vowels was implied, if not explicitly, at least implicitly, in the work of earlier scientists.

SANKARAN marks the junction point[8] between the consonant and the vowel in a consonant-vowel (CV-) configuration by the construction of a conceptual limit, known as the Weierstrass limit, defined according to his theory, in the familiar manner of Dedekind's postulate. This conceptual limit is known as the alpha-region. It is a mind-construct. It is both the vowel and the consonant and also neither the one nor the other and is a pure mathematical fiction.

Any CV-configuration, according to SANKARAN is made up of 'instantaneous entities' (or utterance-events), acoustico-articulatory in character. A Dedekind 'cut' is defined in this continum, which is obviously a mind-construct. Now, these 'instantaneous entities' or 'point-events' are superposed aggregates of observation on *time*. Here the question arises naturally whether in *time* there is a 'cut' corresponding to the one constructed in the continuum we started with. If we say that objectively there is an instant in time which corresponds to the 'cut' constructed in our original continuum, then it leads to a contradiction. For, since time has 1 : 1 correspondence with our original continuum, therefore, for *that* instant too in the time continuum, there should be a corresponding 'point-event' in our original continuum, which is contrary to the hypothesis with which we started.

Therefore, we are faced with the only alternative that in the time continuum there is a 'cut' which is not within *time*, which is a paradox.

8. It is to be noted that this 'point' is not grossly 'between' the gross aspect of the 'consonant' and the gross aspect of the 'vowel'. *Every* point in the whole stretch of the CV-configuration could be defined as the junction point, being each an ultra-elementary constituent—acoustico-articulatory 'event'—of perception in duration, i.e., an infinitesimal segment of a non-Archimedean order in the entire field of the CV or VC stretch.

Cf. in this connection C. R. SANKARAN and P. C. GANESHSUNDARAM, op. cit., p. 410, foot note 33; cf. also C. R. SANKARAN, A Note on the Epistemological Significance of the Alpha-phoneme and the Alpha-phonoid Theories, BDCRI, vol. 14, p. 120, and C. R. SANKARAN, A Philosophical Analysis of the Alpha-phoneme Theory in Relation to Speech-Structure, BDCRI, vol. 14, p. 103.

Also cf., "The entry of the 'time-less' into 'time-order' is the basis of all *measurement*"........ "This [time-less-(time-order)] 'quality' is reflected at every *instant*. It is resembling more to an infinitesimal segment of a non-Archimedean order than to the point in ordinary *'linear' continuum*," (ibid., pp. 101 and 102). See also in this connection, C. R. SANKARAN, Alpha-phonoid Theory (A Study of Speech-structure), BDCRI, vol. 10, p. 64 (1950).

To resolve this paradox, we are perforce compelled to agree with WHITTAKER that no evidence to prove that the notion of an 'instant' corresponds to anything in the world of sense-data is obtainable "from a psychological study of the passage of time in individual experience : for the elementary constituent of perception extends in the time-series over what may be called *duration*, which since it is *sui generis* cannot be defined in terms of anything else, but which bears a greater resemblance to the infinitesimal segments of non-Archimedean geometry than to the 'point' of the ordinary continuum".[9]

Here a word about non-Archimedean geometry will be in order.

Prof. C. T. K. CHARI, of Madras Christian College, has made Sir Edmund WHITTAKER's suggestions a little more explicit[10] and built up a 'geochronometry' in which an 'actual moment' on the 't-axis' is determined only when we assign $t = a + b\eta + c\zeta + \ldots$, where a, b, c. . . . are real numbers and $\eta, \zeta \ldots$ are 'actually' infinitely small quantities of increasing[11] orders. (These 'actually' infinitely small quantities are to be distinguished from what we call 'infinitesimals').

These small quantities η, ζ, etc., can be subjected to an axiomatic treament.

Now, $t_1 = (a_1 + b_1 \eta + c_1 \zeta + \ldots) > t_2 \ (= a_2 + b_2 \eta + c_2 \zeta + \ldots)$, if $a_1 > a_2$. If $a_1 = a_2$, then the inequality rests on the second coefficient (i. e., $b_1 > b_2$) If $a_1 = a_2$ and also $b_1 = b_2$, then the inequality rests with the third coefficient (i e., $c_1 > c_2$) and so on.

η, ζ, ...are 'actually' infinitely small quantities in a new and distinctive sense. For, an arbitrary finite multiple of η (viz., $\lambda . \eta$) is smaller than any positive finite number, contrary to the axiom of Archimedes, viz., given the positive numbers η and a, it is always possible to find a finite integer λ such that $\lambda \ \eta > a$, no matter how small η is nor how large a may be.

But precisely the property that an arbitrary finite multiple of η (viz., $\lambda . \eta$) is less than a positive finite number a characterises the η as an infinitely small quantity. In the same way, $\lambda . \zeta < \eta$, i.e. ζ is an infinitely small quantity of higher decreasing order than η. This is known as the Veronesean continuum after the Italian geometer Giuseppe VERONESE.

9. E. T. WHITTAKER, *From Euclid to Eddington—Tarner Lectures*, p. 41; Cf. also C. R. SANKARAN and P. C. GANESHSUNDARAM, op. cit., p. 396.

10. C. T. K. CHARI, Is Time Metrizable?, *Proc. of the Indian Philos. Congr.*, 1951, pp. 138-39; see also C.R.S. and P.C.G., op. cit., p. 398.

11. The term *decreasing*, used in this connection, seems to be more appropriate, as it marks a continuum entirely of a different nature from the linear one with which we are normally familiar.

PLATE I

The tambura bridge and the two-dimensional vibration of any point on the string (viewed along the length of the string).

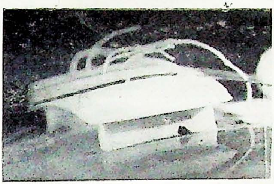


Fig. 1.
The *tambura* bridge.

Fig. 3.
Vibration of the *tambura* string in which the action of the bridge makes any point on the string vibrate almost equally in both the perpendicular directions (viewed along the length of the string).

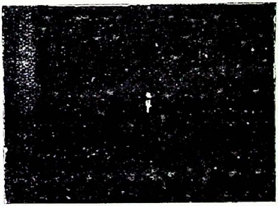


Fig. 2.
Vibration of a particle on an ordinary string whose tension was altered bit by bit by drops of water falling in a pan attached to one end, resulting in two-dimensional motion of the particle although more in the vertical direction.

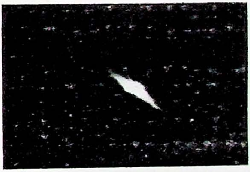


Fig. 4.
Same as Fig. 3. The vibrations are at 45° to the vertical and horizontal directions.

(My thanks are due for the above photograps and experimental arrangements particularly to Mr. Z. S. Ansari of the Deccan College Research Institute, to Shri. B. Chaitanya Deva and to Shri. H. V. Modak of the Physics Laboratory of the Wadia College, respectively).

The postulate of Archimedes can be deduced as a consequence of Dedekind's axiom of continuity. Now, the Veronesean continuum is a less restricted axiom of continuity with the renunciation of the postulate of Archimedes. On the basis of this continuum, Giuseppe VERONESE built up a *non-Archimedean geometry*, involving, as we have seen, a continuum of higher type than that of Dedekind, and leading to a 'non-Archimedean arithmetic' in correspondence with it.

Defining the non-Archimedean time-order, we surrender the analogy with the 'logoi' or the ordinary real numbers.

This non-Archimedean time-order, or a Veronesean continuum, is of a less restricted type than the Cantor-Dedekind type of continuity.

Now, a function non-linear with such a topological *time-order* is conceived in SANKARAN's theory. It is to describe the *relation* with time of the *structure* of the *interval* (i.e., the alpha-phonoid of Prof. SANKARAN) between the consonant and the vowel, where, obviously, the amplitude of the oscillation is reduced to an insignificant amount in a configuration of the type consonant-vowel.

In terms of such a basic characteristic value differential equation, all the speech sounds are then to be derived in the form of field equations.[12]

Through such a programme it is, therefore, suggested that the *non-Archimedean goemetry* (involving a continuum of a higher type than Dedekind), which is the present means of a symbolic representation of *time*, will have a physical significance, indicating the very close harmony between the laws of thought and the phenomena of the external world.

We have seen that SANKARAN first conceived the alpha-phonoid to be the region where the amplitude is reduced to an insignificant amount. This scaffolding as he chose to describe it, meaning thereby the representation of the physical concept, he improved upon by conceiving the 3 msec. interval as the alpha-phonoid, this interval being significant for speech, as given by the Cathode ray translator of the Bell Telephone Laboratories, which gives 333 sweeps/sec.

Now a further refinement is effected to the concept of the alpha-phonoid.

12. Here one may be reminded of Schrodinger's derivation where he starts from a representation with continuous wave-functions, which he abandons at once in favour of a discontinuous one (by a Fourier transformation). Cf. Max BORN's *Natural Philosophy of Cause and Chance*, Appendix, p. 189.

We have theoretically devised an experiment for the determination of the 'minimum duration' of a 'unit information cell' under standard conditions. We propose to find out the threshold duration of a continuous cortical or neurological response corresponding to an acoustical (physical) intermittent stimulus.

Prof. SANKARAN points out here that we operate on two orders of infinitesimals. One is the acoustical (physical) stimulus and the other is the physiological response (or even psychological response as it is envisaged).

Since we operate on these two orders of infinitesimals *simultaneously*, the resulting order is non-Archimedean.

We shall see shortly that the acoustical (physical) phenomena are continuous variations in comparison with the articulatory and auditory (i.e., neurophysiological) phenomena.

The heuristic phonetician or linguist tries to Judge between the two series of observables provided by acoustical and articulatory phonetics, "as to which more fully (~subtly) discovers (~ illuminates) the facts of human speech production."[13]

We, unlike the heuristic phoneticians, are not seeing the acoustical and articulatory series of observables in isolation. We see them together forming a Veronesean continuum, where the acoustical and articulatory series of observables are ordered with elements belonging respectively to two different orders of actually infinitely small quantities.

Thus acoustical (physical) time and articulatory (neurophysiological) time are not equal as hitherto supposed, but are different, even when measured from a common origin.[14]

IV. The Information or Communication Theory of C. Shannon, D. Gabor, N. Wiener and Warren Weaver :—

We shall now see what is meant by an 'information cell' that was just referred to.

D. GABOR has shown that.[15]

13. Cf. C. R. SANKARAN, *Deccan College Monograph Series*, No. 7, p. 30; also W. D. PRESTON's review of R. C. TRUEX and C. E. KELLNER's Detailed Atlas of the Head and Neck, *Intern. J. Am. Ling.*, vol. 15, p. 246.

14. C. R. SANKARAN, A Study of Speech-Structure, BDCRI, vol. 12, p. 221, fn. 3.

15. GABOR, *Nature*, 159, 1947, p. 591; also *Nature*, 166, 1950, p. 724.

$$\Delta t . \Delta f \approx 1$$

That is, the precision with which one can determine frequency is limited by the precision with which one measures time and *vice versa*, since time and frequency are not independent quantities.

Thus to specify the smallest unit that can be determined with any degree of accuracy a 'unit' called a 'logon' is defined as the product of frequency and time and is therefore dimensionless.

A unit 'information cell' is a logon with a unit intensity, for in addition to time and frequency a sound has also a third parameter which is the amplitude (or, let us say, the intensity, which is proportional to the square of the amplitude).[16]

Now what is 'information' in the sense in which it is used here?

The concept denoted by the term 'information' must not be confused with 'meaning'. "In fact, two messages, one of which is heavily loaded with meaning and the other of which is pure nonsense, can be exactly equivalent," from the point of view of the Communication theory, "as regards information".[17]

It has been found in practice that the message to be conveyed from a source (ie., a speaker or a transmitting station) to a receiver (i.e., a hearer or a receiving radio set) can always be selected out of two alternatives. (If there are more alternatives, they can be selected in two sets of alternatives successively, until we come down in this process to two individual alternative messages).

"The amount of information is defined, in the simplest cases, to be measured by the logarithm of the number of available choices."[18]

The simplest case is that of having two alternative choices. This is taken as a unit information. It is to be noted here that $\log_2 2 = 1$.

Therefore, information is measured in terms of the logarithm to the base 2. If there are say 16 alternatives, then the number of information units will be given by $\log_2 16 = \log_2 2^4 = 4$, and so on.[19]

16. Vide Hallowell DAVIS, Information Theory: 3, Application of Information Theory to Research in Hearing, JSHD, vol. 17, pp. 189-197.

17. W. WEAVER, *Recent Contributions to the Mathematical Theory of Communication.*

18. W. WEAVER, ibid.

19. For a thorough theoretical treatment of the concept of *information* vide, C. SHANNON, *The Mathematical Theory of Communication*, Univ., of Illinois Press, 1949.

V. Neurophysiology and Mathematical-Biophysics :

The process of speech production, the propagation of speech-sounds in the physical medium (including the so-called 'ether' if we consider also radio propagation) and the process of hearing, talk of the speech elements in their own terms.[20]

For example, during the production of speech, the speech organs are brought into play. Their movements and the tongue positions in the mouth cavity are all to be specified to describe the types of sounds produced. But how these are related to the acoustical aspect of speech-sounds cannot be directly established. The acoustical aspect has its own language. Further on, the transmission line has its own language although closely related to the acoustical. When a human being listens to the messages, nerve currents are set up in his auditory nerves. (We shall come to this later). Here it suffices to say that a description of the processes of hearing has its own language.

It has been pointed out by Warren WEAVER, Hallowell DAVIS and others that the concept of 'information' is the only one that is common to all these different fields of speech communication and that the language of the communication theory alone is capable of handling all these fields at once in a unified manner.

This naturally leads us on to the consideration of the neurophysiological processes of hearing. It is well-known that the nerve currents are not continuous steady currents but are intermittent "volleys" of nerve impulses. If the stimulus is above the threshold of a nerve, then the nerve will "fire" an impulse. Once a nerve has "fired", it takes a little time of about 2 milliseconds before it can "fire" again. Thus it is impossible for a single nerve to follow faithfully the continuous variations in a physical stimulus. This drawback is compensated for, by the presence of a large number of nerve fibers "firing" at various frequencies.

The nerve fibers function on an 'all-or-none'[21] principle, that is, either they transmit the whole impulse corresponding to a stimulus or none at all. Their functioning can best be described, following N. RASHEVSKY, in terms of the Boolean algebra. The mathematics dealing with neural processes invariably has to do with exponential functions.

20. Cf. in this connection, Hallowell DAVIS, Auditory Communication, JSHD, vol. 16, p. 7.

21. C.R.S. and P.C.G., op. cit., p. 401, footnote 16; cf. also N. WIENER, *Human Use of Human Beings*, Boston, 1950, pp. 73-76, for a caution against the strict adherence to the all-or-none law in nerve conduction.

We have seen already that the information theory has to do with the logarithm of various quantities—particularly the logarithm to the base *two*.

Boolean algebra and exponential functions on the one hand, and the logarithm to the base 2 on the other, have an obvious relationship, although the neurophysiologists and the Information theorists seem to have been all along proceeding in their own respective ways.

Just one step will lead them to a unified mathematics. Many workers are now attempting this unification.

The neural process is an intermittent phenomenon and is perceived by our consciousness as a continuous phenomenon corresponding to the continuous phenomena in the physical medium outside.

N. RASHEVSKY, Warren S. MCCULLOCH and others have developed what is known as Mathematical Biophysics to comprehend all the neuro-physiological phenomena. Their work in the field of neurophysiology has widely developed a logical system of symbolic calculus. It will only be a further step, as we have seen, to connect this symbolic calculus and the theory of Communication, which is being attempted by us here as well as by other workers elsewhere.

VI. The Three Approaches to the Problem of Speech-Structure that are being carried on at the Phonetics Laboratory :

Here, we may sum up that there are three approaches to the problem of speech-structure.

Out of these three approaches, I have already tried to present here in the simplest form, Prof. SANKARAN's purely hypothetico-deductive approach. SANKARAN's theory is a geometrical-physical theory, which, though originally developed from certain observations in speech-phenomena, is independent of any physical facts. It questions all empirical and inductive approaches and challenges all the hitherto known notions of continuity, linear ordering of time and other such fundamental questions. Any factual observations that would confirm his theory are purely incidental, so far as the theory itself is concerned.

Since his theory deals with different orders of infinitely small quantities and a non-linear ordering of *time,* (i.e., a topological time-order not assimilable to Cantor Dedekind type of Continuity) one is naturally faced with several bizarre and perplexing concepts.

I need hardly say that the second and third approaches are mainly phenomenological. They are only conveniently classified as two different

approaches, and are due to the inspiration given by the inauguration of a purely non-phenomenological approach, due to SANKARAN, implying a wider synthesis, as I have tried to show in a short compass, demonstrating once again, that "the cosmic religious experience is the strongest and the noblest thing behind scientific research which is derived from it" in the words of EINSTEIN.[22]

The second approach lies in attempting to evolve a unified mathematics in the wake of the Information or the Communication theory due to GABOR, SHANNON and others and of Mathematical Biophysics due to RASHEVSKY and others to embrace all the speech-phenomena starting from the brain and being transformed into acoustical waves by the articulatory processes and re-converted into nerve impulses by the hearing mechanism, finally reaching the brain and completing the circuit.

This is a closed circuit and there must be one unified law governing the various processes in it (viz., the neurological, the acoustical and even the psychological).

The third approach (which again is only taken for the sake of convenience to be distinct from the second, although essentially not different from it) is the further extension of the "puff" theory of SCRIPTURE, taking only the acoustical aspect into consideration, for the present, and in the wake of our own investigations on the *tambura*.

VII. The non-linear Oscillations of the tambura and the possible extension of the methods of solution to speech-sounds :

The tambura is a simple stringed instrument with the only complication of having a peculiar type of bridge on one end.

The bridge (see Plate I) has a slight depression in which is inserted a thread. Beyond this depression there is a slight hump. When the string begins to vibrate it makes an intermittent contact with the hump once in each period of the fundamental. Thus the bridge reacts with the string, giving intermittent impulses to the vibrating string.

Sir C. V. RAMAN's observations[23] of the above phenomenon were summed up in a mathematical equation by K. C. KAR [24] in the wake of the

22. Philipp FRANK, *Relativity—A Richer Truth*, p. 119.

23. RAMAN, C. V., On Some Indian Stringed Instruments, *Proc. Ind. Assoc. for Cult.*, of *Science*, 7, pp. 29 ff. (1921-22).

24. K. C. KAR, The Dynamical Theory of the Bridge of a Certain Class of Stringed Instruments, *Phys. Rev.*, vol. 21 (2), 1923, pp. 695-698; also *Phys. ZS*, Bd. 24, S. 63, 1923.

theoretical analysis of impulses by E. BUDDE.[25]

KAR assumed that the impulses occur twice during each complete period of the fundamental, which is of course not the case in the tambura. The impulses occur in the tambura only once in each period of the fundamental. GUNNAIYA and SUBRAHMANIAM,[26] taking KAR's equation obtained an expression by assuming that there is only one impulse during each period of the fundamental.

So that, while KAR's equation accounted for the intensification of all the odd harmonics with a corresponding diminution of all the even harmonics, the expression derived by GUNNAIYA and SUBRAHMANIAM showed that not only the odd but also the even harmonics were intensified.

We actually find in the tambura, that all the harmonics are intensified.

It is, however, found (so far observed by us only through ear judgement) that there are not only odd and even harmonics but also odd and even half-multiples of the fundamental.

Even the physical presence of a subharmonic of order 2 was found by the familiar rider test. The sub-harmonic may either be due to the intermittent reaction of the bridge or to the resonating box or to both.

It is quite evident, however, that the action of the bridge is more responsible for the production of all these inharmonic components, since, it is found that, when the thread is removed, most of these inharmonics almost completely disappear.

Our observations on the vibrating string show that the string is in contact with the bridge at the intermittent point of contact for nearly half the period of the fundamental. So that, in comparison with the period of the fundamental, the reaction of the bridge is not instantaneous but it extends over a considerable duration. Thus the reaction cannot be treated as an impulse in the strictest sense, as is required in BUDDE's derivation. However, as a first approximation the impulse is assumed to extend over half the period of the fundamental in deriving an expression in the wake of BUDDE, KAR, GUNNAIYA and SUBRAHMANIAM, and it is found fairly to account for the presence of all the inharmonics we have observed.

25. E. BUDDE, Resonanzerregung durch periodisch wiederholte Impulse, *Phys. Zeits.*, Bd. 18, 1917, pp. 69-73.

26. D. GUNNAIYA and G. SUBRAMANIAM, *Phys., Rev.,* (2), vol. 25, p. 99, 1925.

Further, when the duration of the impulse tends to zero in this expression, the expressions due to KAR and GUNNAIYA and SUBRAHMANIAM are obtained as limiting cases.

But it must be admitted that this method of derivation is not quite accurate for a non-linear phenomenon of the type met with in the vibration of the tambura string.

Such a non-linear vibration does not lend itself to Fourier analysis except with great difficulty in determining the fundamental period (which, as we discovered in the preliminary oscillograms we have taken, is not constant).

It is also obvious, even to the naked ear, that no frequency generated by the tambura has a steady intensity. The intensity is waxing and waning at a few cycles per second, with different periodicities for different frequencies.

It is believed that the methods of operational calculus alone will provide suitable solutions for this non-linear vibration.

Mathieu functions have been used to the analytical description of the non-linear vibrations of strings subjected to continuous periodic variations of tension, etc., giving rise to a sub-harmonic frequency of order 2 or 3.

In tambura we have to deal with intermittent impulses rather than with continuous periodic variations.

Another interesting observation we have made on the vibrating string of the tambura (and, which, in spite of several attempts, we have been able to photograph only with moderate success), is that the string does not vibrate in a single plane, but has components in perpendicular planes and these are fluctuating in their amplitudes, now greater in one plane, now greater in the perpendicular plane, and so on.[27]

The non-linear vibration of the string in two perpendicular planes naturally suggests an extension to three mutually perpendicular planes in the case of speech-sounds.

Any particle on the string has only two degrees of freedom, whereas any particle of air has at least 3 degrees of freedom.

27. With the colloboration of Mr. H. V. MODAK of Wadia College, we are exploring each point on the vibrating string, by studying the induced current in the string, produced by a strong magnetic field at the point (or element) of the string, as the element cuts across the field. It is as yet too early to give any results here.

The mathematical expression that fully describes the non-linear oscillations of the tambura, specifying all the frequencies generated, harmonic and inharmonic alike, can, by a further generalization be extended to speech-sounds, thereby accounting for the innumerable inharmonics in vowel-sounds.[28]

28. In a separate paper, based on certain assumptions, an attempt is being made at deriving mathematical expressions that account for the presence of inharmonics, for the comparatively stationary positions of the "formants" in the vowel-spectra (irrespective of the voice frequency) and for the phenomenon of waxing and waning of the intensity in the sound components produced by the *tambura*, in the wake of the Frequency Modulation spectral analysis.

(Cf. in this connection P. C. GANESHSUNDARAM, The Structure of Speech-Sounds, op. cit., and C. R. SANKARAN, A Note on the Epistemological Implications of the Alpha-phoneme and the Alpha-phonoid Theories, BDCRI, vol. 14, p. 120, "Now, each 'event' constitutes a type of regularity, in a deeper sense of the term, which is *ultimate* and *non-causal*").

ON THE TEXT OF THE KṚṢṆAKARṆĀMṚTA OF BILVAMAṄGALA[1]

By

H. G. NARAHARI

The land which gave the world a Śaṅkara and a Kulaśekhara has brought, quite often, to the literary horizon many a problem of the very first magnitude. Of Śaṅkara, the celebrated protagonist of Advaita, it would be idle, even now, to assert anything more than that he is the commentator on the *Brahmasūtras*, the *Bhagavadgītā*, the *Bṛhadāraṇyaka* and other older Upaniṣads. And, concerning the identity of Kulaśekhara, author of that 'sweet devotional lyric', the *Mukundamālā*, the final word is yet to come.

It is to this land, to Kerala, that we owe another mellow lyric, the erotico-mystic *Kṛṣṇakarṇāmṛta* (KK.) of Bilvamaṅgala (*alias* Līlāśuka). In point of the ease and mellifluity of its diction, of the 'artistic and human appeal' it so amply affords, its only serious rival is perhaps the *Gītagovinda* of Jayadeva.[2] Such is the popularity of the poem throughout India that there is not a province here which does not claim it for its native. The identity of the author and his original name are also sometimes disputed.[3] The KK. has been edited often and in more than one script. An attempt at an English translation of the poem was also made at Madras in 1924.

It was in 1938 that Professor S. K. De, who published then a critical edition[4] of the poem as it is known in Bengal, propounded the view that the Bengal tradition which is uniform in accepting only Śataka I of the KK., represents the original form of the poem, and that the remaining two Śatakas unknown to it "but known to Pāpayallayasūri and to comparatively recent South Indian and Western Mss. arose at a somewhat later date."[5]

Perhaps the most important of the arguments advanced by the learned Professor in support of his contention is that, while a good num-

1. In a summarized form the paper was submitted to XV All India Oriental Conference, Bombay, November 1949. In its present form it was originally intended for the *Prof. Gopala Menon Presentation Volume* planned at Trivandrum in 1950.
2. H. G. Narahari, *Adyar Library Bulletin*, February 1944, p. 42.
3. *Ibid.*
4. Dacca University Oriental Publications Series, No. 5.
5. *Introduction* to his edition of the KK., pp. ix ff.

ber of verses of Āśvāsas II and III can be traced in apocryphal works like the *Sumaṅgalastotra* or the *Bālagopālastuti,* ascribed to Bilvamaṅgala, "no verse of the first Āśvāsa occurs in any of them."[6] This is highly erroneous in view of the fact that elsewhere[7] Professor De himself admits that Āśvāsa I of the KK. has not only the same benedictory verse as the *Sumaṅgalastotra*[8] of Bilvamaṅgala, but has also *four* verses in common with another apocryphal poem ascribed to Bilvamaṅgala, the *Bālagopālastuti.*[9] Further, two other poems of Bilvamaṅgala, the *Bilvamaṅgalastotra*[10] and the *Kṛṣṇabālacarita,*[11] are known to have each *twelve* verses[12] in common with Āśvāsa I of the KK. Even the *Viṣṇustuti,* another apocryphal poem of Bilvamaṅgala, may have some verses in common with Āśvāsa I of the KK.[13] though, on the basis of the incomplete Ms.[14] of the poem available to me some years ago, I cannot say what those verses are. It is thus clear that all the *three* Āśvāsas of the KK. have been uniformly interpolated, and no one of them has greater claims than the other in point of genuineness.[15] But it would be difficult to infer, on this score, that the entire text of the KK. is later than the apocryphal works of Bilvamaṅgala wherein it takes its birth. For the KK. is very popular all over the country, while the other poems of Bilvamaṅgala are hardly known even in places where their Mss. are available. Further, an examination of the contents of some of these apocryphal poems reveals that they are only miscellaneous collections culled from various sources. For instance, the *Bilvamaṅgalastotra* referred to already has *two* verses from the *Bhāgavata, three* from the *Mukundamālā* and *one* each from the *Daśakumāracarita* and the *Rāmāyaṇacampū* of Bhoja.[16] It would thus be reasonable to assume that the KK., so far from taking

6. *Ibid.*, pp. xiii ff.; *Indian Historical Quarterly,* June 1944, p. 179 f.

7. *Ibid.*, pp. xxi, 373.

8. Commonwealth Relations Office Library Ms., *Eggeling* 3907.

9. West Indian Illustrated Ms. with O. C. Gangoly; another illustrated MS. of this poem has been described recently in the *Journal of the University of Bombay,* September 1947, pp. 33 ff.

10. Ms. (No. 3107) in the Anup Sanskrit Library, Bikaner.

11. Ms. (No. 292 of 1884) in the Bhandarkar Oriental Research Institute, Poona.

12. For details see K. Kunjunni Raja, *Indian Historical Quarterly,* March 1946, p. 68.

13. Dr. De appears to overlook this possibility (IHQ., June 1944, p. 180).

14. Adyar Library Ms. (XL. A. 116) described by me *in extenso* in the *Adyar Library Bulletin,* February 1944, pp. 37 ff.

15. H. G. Narahari, *Descriptive Catalogue of Sanskrit Mss. in the Adyar Library,* 1950, Vol. V, p. 148.

16. For details see K. Kunjunni Raja, *op. cit.,* p. 69 n.

birth in the apocryphal works of Bilvamaṅgala, is among the sources of all such collections of Kṛṣṇaite verses.[17]

It is indeed true that, while tradition in Bengal has ever been constant in accepting "definitely one section, viz., the first, with 112 verses," "there is no agreement in the respective number of verses in the so-called three Śatakas or Āśvāsas of the South Indian Mss. and printed edition."[18] But this does not mean that the latter tradition which believes in *three* sections can be dismissed lightly as of little account. It must be noted clearly that this is the tradition prevailing in the province to which we owe the text, and has, as such, more weight than any other tradition. Some of the oldest Mss. of the KK. available in this province, i.e., Kerala, conclude[19] with the following verse according to which the text of the KK. contains 303 verses :

कर्णामृतं भगवतश्चरितं रसज्ञः
श्लोकत्रयाधिकशतत्रयमादरेण ।
शृण्वन्पठन्ननुदिनं समुपैति सिद्धिं
सिद्धो यथा सकललोकविहाररूपाम् ॥

The same tradition of *three* sections appears to hold good, as admitted[20] by Professor De himself, even in Western India. If it is true that, for a tradition to be authentic, it must have the support of commentaries, even then the three-section tradition is at no disadvantage. If Gopālabhaṭṭa, Caitanyadāsa and Kṛṣṇadāsa Kavirāja are there to uphold the one-section tradition, in support of the latter tradition we have Pāpayallayasūri, Brahmadatta and Avañca Rāmacandra in South India, and Śaṅkara and the author of the *Kṛṣṇānandaprakāśinī* in Western India. And if today editions of the KK. in these parts of India, not only do not have a common text among themselves, but also each contains more verses[21] than allowed by tradition, it only shows that, to the extent these extra verses are concerned, the KK. has not escaped the fate to which similar popular poems like the Śatakas of Amaru and Bhartṛhari are known to have been subject.

17. H. G. Narahari, *op. cit.*, p. 149.

18. S. K. De, *Introduction* to the KK., p. vii.

19. Ullur S. Paramesvara Aiyar, *Proceedings of IX All-India Oriental Conference*, Trivandrum, December 1937, p. 475.

20. S. K. De, *op. cit.*, p. iv f.

21. Keralapāṭha has 336 verses, Āndhra, 329, Tamil (Vanivilas Press, Edn., Srirangam), 319 verses and West Indian (Jagadisvara Press Edn., Bombay, 1891), 331 verses. Some of the West Indian Mss. available to Dr. De (*loc. cit.*) give verses ranging in number from 299 to 410!

The Bengal tradition appears to date from the time Caitanya (A.D. 1486-1533) discovered and took the KK. with him while returning from a pilgrimage in Southern and Western India, and 'introduced it to his followers.'[22] If the KK. was then known in *three* Śatakas, "it is not likely," it is averred,[23] "that Caitanya would have brought back to Bengal the tradition of only one Śataka of the work, on which his immediate disciples and followers wrote commentaries." But this is no formidable objection to meet. If Caitanya took back with him to Bengal only *one* Śataka, it should only be because the Ms. that was available to him then contained only so much of the text. Even now, of well-known works like the *Ṛgveda* or the *Raghuvaṁśa*, it is not impossible to meet with incomplete Mss. ! The followers of Caitanya may not have waited, as I have stated elsewhere,[24] to think why their *guru* introduced to them only so much of the KK. They may not even have realized that what was brought to them is only a fragment; and, refraining, out of respect, from all reasoning, should have attached special importance to the portion as that chosen by their preceptor, even though the fact may actually be that that was all what Caitanya could lay hands on during his tour of South India.

Further, concerning the evidence that the last verse of the *Padyāvalī* of Rūpagosvāmin can furnish in this context, I have already[25] made my position clear. I have nothing to add now.

It appears to me, therefore, that it is still unsafe to conclude that Āśvāsa I of the KK. is alone genuine and that the remaining *two* are spurious. What can, however, be asserted with safety is that the poem exists in *two* recensions, the one consisting of a *single* section and popular in Bengal, and the other consisting of *three* sections and popular in the southern and western parts of India.

22. S. K. De, *op. cit.*, p. ix.
23. *Ibid.*, p. xi.
24. *Adyar Library Bulletin*, February 1944, p. 44 f.
25. *Ibid.*, p. 45.

REVIEWS

Purātattva vijñāna, by Dr. Baijanath PURI. Published by Kitab Mahal, Allahabad, 1952, pp. 7+111, with 2 plates and several line drawings, Price Rs. 1/4 only.

In the post-partition period archaeology in India has made a great progress. This has been possible not only due to the work of the Department of Archaeology of the Government of India but also by the interest the various Universities in India have been taking in Field Archaeology, of late. It has enabled excavations at Maheshwar, Nasik, Newasa, Tripuri, Sirpur, Baroda, and Kausambi. Participation by the Universities coupled with the clamour for Hindi as the national language and regional languages as the media of instructions in colleges, has necessitated the writing of books on scientific matters in Hindi and other languages in India. Dr. PURI'S book *Purātattva-vijñā*na, (The Technique of Field Archaeology), is an attempt—a successful attempt, indeed,—in this direction. *Purātattva-vijñāna* seems to be the first scientific booklet so far in Hindi regarding field archaeology, which will not only prove that archaeology is a practical science but will also go a long way in removing the misconceptions about an archaeologist, who is labelled as 'a treasure-hunter' by the people at large.

The booklet is divided into eleven chapters dealing with the progress of archaeology, the beginning of an excavation, the technique of digging, recording, pottery, copying, photography, preservation of antiquities, packing, publication of report, and conservation of the excavated site and the arrangement of exhibiting the finds in a museum.

In the first chapter the author discusses the importance of archaeological digging, the technique of finding out a buried site on the basis of explorations and surface indications and finds. Before undertaking the actual work of the excavation, properly trained staff is an essentiality. The qualities expected of a supervisor, the implements required, the importance of a control pit as also the supervisor's benevolent check on his workers are discussed in the second chapter. The next chapter deals with the importance of surveying the mound, the advantages and disadvantages of parallel and square trenches, the archaeological and geological interpretations of various layers and dating them from the finds, the know-how of the procedure involved when brick, stone and mud structures are exposed, drawing of plans and sections, grave-digging and the treatment of skeletons found in it, and lastly, proper and accurate

recording of the finds. These various matters are illustrated and well explained. For the sake of accuracy, exact recording is essential. It differs if a datum-line is not fixed. The datum is essential when the trenches are on a slope or when one is digging a *stūpa*. The proper drawing of sections with different symbols showing the contents of the layer is essential, as that facilitates the correct writing of the report when the excavations are over. All these aspects are explained in the fourth chapter. Over and above all these things lies the importance of pottery. For, in the absence of any other datable evidence, only pottery can tell the story of a dead civilisation. The importance of pottery, the pottery-yard, the selection of pottery, the sherds indicative of the technique of the making of a pot, the slip, polish, the impoftance of datable pottery, and washing are discussed in the fifth chapter. The next chapter deals with the technique of taking casts, making drawings, etc. Archaeological photography is different from normal and popular photography, and hence all problems connected with it are detailed out in the seventh chapter. Preservation of antiquities is as important as their take-out from the buried state. This requires the setting up of a small laboratory and the treatment at the hands of a chemist. Coins, bones, metals, etc. require cleaning and preservation. The eighth chapter gives notes on these. The last three chapters deal with packing, publication, conservation and matters allied to these.

The author has an easy and simple style and at many places he has given in brackets English substitutes for Hindi words. These will, in the beginning, be a bit difficult to digest until they are fully adopted in schools, colleges, and in scientific usage. One or two discrepancies have, however, remained—but these are minor ones. For instance, nowhere the English substitute NBP (Northern Black Polished pottery), has been given for the '*Uttarī Bhārat ke camakate phikare*' (p. 72). So also '*Ancient India*' volumes have always been referred to as '*Prācīna Bhārat*' (p. 70). This is bad practice, for no one has a right to change or translate the name of a book or its author. On the other hand, no words in Hindi have been used for such words as 'details' (p. 80), and 'register' (p. 89). The rendering of 'Punch-marked coins' as '*cihnadār sikke*' (p. 108), does not bring out the implications of punching, for all coins have some sort of '*cihna*' over them. One or two misprints have remained (p. 91: '*catrita*' for '*citrita*'; '*khilaute*' for '*khilaune*' p. 108).

The illustrations are not bad. A general topical index and an index of technical terms rendered into Hindi would have still more enhanced the utility of the book. In spite of that, the book is useful for beginners in archaeology, and Dr. PURI is to be congratulated on his

successful presentation of a scientific subject in simple Hindi. This, it is hoped, will also give inspiration to writers on scientific topics in other regional languages in India.

S. B. DEO.

Descriptive Catalogue of the Secret and Political Department Series—1755-1820. Compiled by Dr. V. G. DIGHE. Government of Bombay Publication., Bombay, 1954. pp. 652.

The Bombay Archives are one of the most important archives of India. To a student of the history of the British regime in India and of the later Maratha period, nothing is more indispensable than the Bombay Records as a source of original material, giving an insight into other (British) side.

This vast record of 98,000 volumes and 300,000 files consists of correspondence, documents and books received by the President-in-Council at Surat and later on (after 1687) by the Governor-in-Council at Bombay. Besides there are factory records and records of subordinate offices in Bombay and also records of political missions, committees etc. sent by the British. There is no side of social activities which these papers leave untouched. As Dr. DIGHE puts it, "The records form the memory or represent the rich experience the province has gained in the last two or three centuries."

The compiler of this precious volume is to be congratulated on his having brought his chosen task to completion, after a patient labour of nearly ten years.

As explained in the introduction, press-lists are now out of vogue for want of indication of their subjects matter and exhaustive subject-index. While preparation of Calendars with introduction and index on the line of Persian Calendars is too a very elaborate and a long-time process. The compiler, therefore, has chosen the 'via- media' between the bare press-list and the exhaustive calendars and has brought forth this descriptive list or catalogue. The Diaries are chronologically arranged and subject matter is given page by page. The work concludes with an index. The introduction gives a general survey of the work of Bombay Archives and of the series in particular.

The period under review is full of political and diplomatic events, and is one in which we see the distinct rise and fall of the British and the Maratha powers respectively. The political relations of the company's Government of Bombay and its schemes, plans, and diplomacy with its

neighbours is unfolded to us in the pages of this volume. The topic of absorbing interest is the Anglo-Maratha rivalry. The sack of the Angrias 1755, Janjira Affairs 1759, Haidar-Maratha contest 1761-73, Anglo-Maratha wars, and reports regarding Gaikwads, Angrias and Sawants are the main divisions of this period. Reports on the states of Gaikwad, North Gujarat, Kathiawad and Cutch are full of information helpful for the history of Gujarat. We get ample material for the history of Bombay Marine from 1755 onwards, and especially its activities against Angrias, the Malwan pirates, and several expeditions fitted out against Cutch and Kathiawad pirates and the pirates of the Persian Gulf.

Other subjects dealt with in this volume are the organisation of the Bombay army, of the defences of the island of Bombay and of Surat against enemies from the sea, the conquest and administration of Malabar till its transfer to Madras Presidency in 1801, and the British Factory at Tellichery—a beehive of British intrigue in the south. The eviction of the French from the Indian stage and the increased activities of the French agents in India during Napoleonic Wars is also a fact to be noticed.

One English historian has remarked, "India fell before the British character." We feel the truth of this remark when we compare the behaviour of the British and Maratha Statesmen during the period under review. Raghoba alone is not to be blamed for his overtures to the British. Nana Saheb Peshwa, Sakharambapu, Moroba and even Mama Pethe had had their overtures to the British. Though the Maratha State was a house divided against itself, the British too, were not immune from internal rivalry. There were rivalries between the Bombay Company and the Bengal Company; between the By. Co. and the G.G.; between Madras Governor and the G.G.; between the Directors in England and the British authorities in India; and at last between the G.G. and his own Council. But the interest of the nation was of paramount interest to all. The ignominy of Talegaon (1779) in the First Anglo-Maratha War resulted in the long inquiry into the causes and the court-martial of the culprits. Such an inquiry was unknown to the Maratha State!

While going through the pages the reader comes across many interesting facts and events. For instance the following few are worth noting here :—

(1) From the British point of view Tarabai and Maratha sirdars were hostile to the Brahmin Government of the Peshwa.

(2) In 1767, in order to divert Peshwa's attention from Karnatak the British were scheming to foment civil war in his house.

(3) The Dutch were not idle even after the extinction of their settlements in India; but were continuously active in intrigues as late as 1780.
(4) Bombay Company once expressed doubt about Madhavrao Narayan's identity.
(5) In 1778 the English Resident at Poona (Mostyn) complained of his letters being intercepted and destroyed.
(6) Raghoba had borrowed money from one Shaw—an Englishman in Surat.
(7) During Goddard's march towards Poona the Koli rajas had affered their services to the English.
(8) Haidar's death came to be known to the British after more than a month.
(9) The Bombay Company was many times in financial distress. For want of money the Company could not finance Goddard's expedition.
(10) In December 1788, there was a riot between the Parsees and the Muslims in Surat.
(11) In 1789 Surat and Broach coinage was in debased state and steps had to be taken to improve it.
(12) Tipu was going to get American aid. He had sent jewels as present to the French Directory. He had a factory at Maskat and his agents intrigued in Afganistan, Persia and Turkey.
(13) As early as 1800 the British were thinking of precautions to be taken against plague in India.
(14) During the Napoleonic wars, the British were too cautious about their conquests in India. The French were planning to establish factories at Porbunder, Cutch and Sind, and were scheming to march to India through Persia and Kabul. The Portuguese too, during this period, intrigued against the British and the British were planning to oust them from Goa.
(15) Even Jaswantrao Holkar too was carrying on negotiations with the French in Persia.
(16) Peshwa Bajirao Raghunath had attempted to corrupt the native army of the British in 1817.
(17) The British had collected Waterloo Fund subscription from the Gaikwad, the Rana, ministers and merchants of Porbunder and transmitted it to the Duke of Wellington in 1816.
(18) Ballantine's report on female infanticide in Kathiawad.

The Catalogue would serve as an important guide for the researcher at home. It would, no doubt, enable him to lay his finger immediately on what he needs without wasting his time. It would also be useful for confirming the dates in Modi letters by comparing events.

As this volume is a "pioneer attempt", and a "preliminary step to calendaring," it lacks the advantages of a calendar. The researcher's trouble of going to the Record Office is not saved. Had this volume been on the line of Persian Calendar with chronological synopsis in the introduction and summaries of letters, it would have been a great asset to the scholar. The index, however, will prove of use. The get-up of the book is good, but in spite of the errata at the end, many misprints are overlooked and proper names are wrongly spelt. The price is quite moderate and within the reach of the student.

Sir Jadunath SIRKAR has congratulated the Government of Bombay as being "the first and most successful among the Maratha states to publish its historical records". This volume bears testimony to his remark. It is of immense value and importance to the scholars and can serve as a handy reference work. The compiler deserves our hearty felicitations for bringing out such a valuable collection.

P. L. SASWADKAR.

Prākṛta Bhāṣā (In Hindi) ; A series of three lectures delivered under the auspices of the Pārśvanātha Vidyāśrama at the Banaras Hindu University, by Prabodh Bechardas PANDIT. Banaras, 1954, pp. 58, Price Rs. 1-8-0.

The organisers of the Shri Pārśvanātha Vidyāśrama may be congratulated for having arranged a series of lectures on a topic connected with Jaina religion and Prākṛta languages as one of their various academic undertakings. They certainly acted properly in securing the known linguist and Prākṛta scholar of Gujarat, Dr. P. B. PANDIT, to deliver the first series of the lectures on the middle Indian dialects. The importance of a scientific study of these dialects now needs hardly any emphasis. For, without such a study, as the publisher observes in his introductory remarks, a proper linguistic assessment of the modern Indo-Aryan languages will not be possible.

In his first lecture the lecturer does well to give the historical background of the Prākṛtas by showing the relationship which Saṁskṛta, as the representative of the Old Indo-Aryan period, has with the other Indo-European languages. In the second lecture we get the description of the several middle Indian dialects in their geographical distribution. At one place the lecturer has rightly stressed the point that it is not proper to differentiate between languages if they differ from one another in only one or two phonetic features. The last lecture is devoted to narrate the

further development of the middle Indian stage. In this regard the lecturer puts forth two important ideas. In the first place the literature available today does not make it possible to get a clear picture of the further development of the Prākṛtas in the various geographical areas. If the literature in those days had not developed in isolation from the people, if it had treated of the subjects directly concerning the people, we would have been fortunate today to receive specimens of many Prākṛtas which must have been in use in those days in different parts of the country. The second point stressed by the lecturer is that the phonetic changes witnessed in the development of MIA (and for that matter also of OIA) are not absolute innovations. Such changes had already started in the language as a matter of natural course. The contact with the speakers of the other linguistic families in India may have only helped the rapid spread of these changes. It is, therefore, inaccurate to say that the middle Indic phonetic changes (and the morphological changes arising out of them) were due to the ignorance or the laziness of the people who spoke them. Before closing the series, the lecturer has expressed hope that it would be possible for the Pārśvanātha Vidyāśrama and other similar institutions to take up the publication of good editions of Jaina canonical literature. Such editions should be furnished with an accurate description of the language and a vocabulary which would ultimately lead to the compilation of a broad-based Prākṛta grammar.

On p. 21, the Shāhbāzgaṛhī and the Mānsehrā versions of the Aśokan rock edicts are said to belong to the north-east, which is obviously a mistake due to oversight. On the same page, these versions are twice correctly referred to as belonging to the north-west. The reasons given on pp. 7-8, while discussing as to why the works belonging to the Vedic period were not written down, may not represent the correct state of affairs. The explanation may not be sought in the limited knowledge of the script or in the attempt of the Brāhmaṇas to monopolise the knowledge of the intricate Vedic ritual, but into the fact that written texts easily lead to variations, a thing which had to be scrupulously avoided in order to ensure the efficacy of the sacrifices. In the second lecture, the lecturer has attempted a geographical description of the Prākṛtas on the basis of the Aśokan inscriptions. This may be done, but only after a critical examination of the data enabling us to fix what really constitutes the eastern or the western, etc. In this respect it may be permitted to refer to an article published in the Journal of the Oriental Institute, Baroda, Vol. I, pp. 240-44 showing that certain exceptional features occurring in the Dhauli and the Jaugaḍa separate edicts are not eastern but north-western.

—M. A. MEHENDALE.

Beobachtungen über die Sprache des buddhistischen Urkanons Von Heinrich LUEDERS. Aus dem Nachlass herausgegeben von Ernst WALDSCHMIDT. Abhandlungen der deutschen Akademie der Wissenschaften zu Berlin. Klasse für Sprachen, Literatur und Kunst, Jahrgang 1952, Nr. 10, Akademie-Verlag, Berlin, 1954, pp. 196, Price DM 19/-.

It is always a matter of great pleasure to get to read a book by LUEDERS. It is indeed to be regretted that a part of what LUEDERS wrote could not be published during his life time. The result is that some of his complete works like the edition of the Udānavarga have been altogether destroyed and even his other works which are now being published by his pupils were damaged in part. The editor's work for the present volume must have been particularly difficult as the work was not finalised by LUEDERS himself. When the Nachlass came to the editor's hands, the pages were not numbered, the book not divided into chapters, and the beginning of the manuscript completely lost. In spite of these difficulties, the editor has done his work exceedingly well and he deserves congratulations and thanks of all lovers of Indological research. He has not simply put the material of the Nachlass into proper shape; he has also made the book more valuable by referring in footnotes to such paragraphs from GEIGER's *Pāli Litteratur und Sprache* as give additional material which was not found in LUEDERS' manuscript. He also gives suitable references to EDGERTON's *Buddhist Hybrid Sanskrit, Grammar and Dictionary*.

In his Zum Geleit the editor elucidates in short the view held by LUEDERS as regards the language of the supposed original canon of Buddhism. On the basis of the comparison of the Udānavarga verses from the Turfan fragments with their parallels in the Pāli version LUEDERS had come to the conclusion quite early (see references p. 7, footnote 4) that both the Sanskrit and the Pāli texts go back to an original which was composed in the eastern dialect. There has been some controversy regarding this view. Recently EDGERTON in his *Buddhist Hybrid Sanskrit Grammar* has expressed the opinion that we cannot at all speak of an 'original language' of Buddhism. Though LUEDERS had made known his opinion early he had not then published the detailed investigation of the problem which we find in the present work. This collected evidence, well substantiated on facts, should go some way to persuade the opponents of LUEDERS' theory to reconsider their opinion.

The book has been divided into two major parts to which is added a small Anhang discussing some verses from the Udānavarga. The first

part enumerates the various instances from Pāli in which it is possible to discern the eastern influence, and the second part furnishes the picture of the phonology and the morphology of the language of the original canon. As I propose to give a detailed review of the second part at some other place, the present account is restricted only to the first part of the book. It is well known that the most striking elements of the eastern language are nom. sg. ending *-e* and *l* for *r*. In the first part LUEDERS has brought together such instances from Pāli where he finds the influence of these two eastern characteristics and successfully shows that the passages containing these instances yield good sense only when we suppose that they are based on an original eastern version.

The following remarks are therefore offered not in a spirit to controvert the main conclusion of LUEDERS but to elucidate certain points in the material handled by him.

1. § 10, p. 17 : In Jātaka 388,1 we have a word *dāni* in line 1. For this the Simhalese manuscripts read *dāne* and LUEDERS, is right in thinking that this is the correct reading. In the translation of the verse, however, LUEDERS renders *dāni* by 'jetzt'. Pāli *dāni* for eastern *dāne* shows a change of *-e* > *-i* probably indicating, as suggested by LUEDERS, short pronunciation of *-e*. This change is witnessed also in the north-western inscriptions of Aśoka. cf. *duvi* for *duve* (*dve*), *aṁñi* for *aṁñe* (*anyaḥ*), *rajani* for *rajane* (*rājānaḥ*). We also get a similar instance from a version of the minor rock edict, probably under north-western influence. cf. *upeti* for *upete* (*upetaḥ*) in the Kopbāḷ version. For Pāli *hemantagimhisu* for *-gimhesu* (cited on p. 17, f.n. 3) we have an exact parallel in *pavatisu* for *pavatesu* in the Rūpnāth version of the minor edict.[1]

2. § 14, pp. 19-20 : LUEDERS has shown convincingly that the Mahāvastu (II. 238. 17) translator had mistaken *aṇumatte hi* of the original eastern version as one word (*aṇumattehi* instr. pl.) and misconstrued it as adj. to *punnehi*. He, therefore, translated it into Sanskrit as *aṇumātraiḥ puṇyaiḥ*. The whole line then read as—

aṇumātraiḥ puṇyaiḥ artho mahyaṁ na vidyati.

LUEDERS further observes that the translator while doing so did not pay attention to the fact that in putting *aṇumātraiḥ puṇyaiḥ* (6 syllables) for *aṇumatte hi punnehi* (8 syllables) he had shortened the first quarter of the line by two syllables. This is true so far as the written form goes. But perhaps this fact may show that the visarga preceded by the diph-

1. For a similar tendency to change *e* > *i* in the Niya Prakrit and the Kharoṣṭhī Dhammapada see BURROW, *The Language of the Kharoṣṭhī Documents*, § 1.

thong was pronounced as *hi* (*-aiḥ* as *-aihi*) exactly as it is done today in single words at least in Mahārāṣṭra. Hence even though the two words give six syllables in the written form, they were probably pronounced as *aṇumātraihi puṇyaihi* even in a metrical line in order to get eight syllables. This again seems to have been the reason why no sandhi was made between *puṇyaiḥ* and *artho* (= *puṇyairartho*), for that would reduce the pāda by one syllable. LUEDERS is certainly right when he says that in the Lalitavistara version (261.18) there occurred loss of a syllable when *punnehi* was translated by *puṇyaiḥ* because there sandhi was effected between the visarga and the following *a*. This loss of a syllable was then made good by the addition of *me*. cf. *aṇumātraṁ hi me puṇyair artho Māra na vidyate.*

3. § 15, pp. 20-21 : Among the cases where the eastern nom. sg. *-e* was mistaken by the Pāli translator as loc. sg., LUEDERS lists *kule bhadde* which occurs thrice in Jātaka 531.50-52. On p. 21 he observes that in verse 51 the interpretation of *kule bhadde* as loc. sg. seems justified and that this gave occasion to look upon the two words as loc. sg. in form also in verses 50 and 52 where, in the opinion of LUEDERS, they are not justified and where they have to be interpreted as nom. sg. It is a little difficult to believe that the interpretation which is regarded as justified for the middle stanza (51) should have influenced the interpretation of the stanza previous to it (50).

Hence it may be pointed out that the interpretation of the two words as loc. sg. also seems justified in the first verse 50 (p. 21) which begins with the word *yathassu* (for *yatthassu*? FAUSBOELL gives *yatth' assu*). This word meaning 'where' can be more easily connected with *kule bhadde* as loc. sg. than with nom. sg. (*yattha khattiyānaṁ kule bhadde bherī nadati* etc.). It is even possible that this *yattha* coming at the beginning of the first (50) of these three verses is also to be construed with the following two verses (51, 52). Thus when *kule bhadde* is justified as loc. sg. in the first two verses 50 and 51, it is natural to anticipate that it is justified also in the third verse 52. And this in fact actually seems to be the case. With the supposition of *yattha* from verse 50, *kule bhadde* as loc. sg. give good sense here also. The mistaken nom. singulars in stanza 52 are, therefore, not *kule bhadde*, but *-abhirude* and *-nikuñjite* occurring in line one of that verse because as loc. sg. they make no sense. They are thus to be interpreted not as participles used adjectively qualifying *kule*, but as substantives. What is expressed in the other two verses with the use of verb forms *nadati, nikuñjati, hiṁsati,* and *uparodati* is expressed here with the help of verbal derivatives. *abhiruta* and *nikuñjita* are not noted in the PTS Dictionary as substantives, but it gives *ruta* (and *ruda*) as a noun. In Sanskrit, according to

the PW, *abhiruta* and *kūjita* are attested as nouns since Rāmāyaṇa. The verse is, therefore, to be translated as—"(where) in the happy house of the Kṣatriyas there is the noise of peacocks and krauñca birds and the cries of cuckoos—what is happier than that?"

4. § 17, pp. 21-22 : LUEDERS very ingeneously points out that in the Sutta-Nipāta 453 (= Theragāthā 1229) *atthe* and *dhamme* occur as misunderstood loc. singulars. They should have been *attho* and *dhammo* (both nom. sg.) respectively. However, his reconstruction (p. 22) of the line from the parallel passage in the Udānavarga 8.14 as found in the old C_1 manuscript of Berlin is not quite convincing. Actually the line has been read as—

[*sa*]*tya*........*rm. ca saṃ*......*pra*[*t*] *iṣ*[*ṭh*]*i* . . [*m*]/

LUEDERS suggests the reconstruction of the line as—

satyām arthe ca dharme ca santa āhuḥ pratiṣṭhitām/

where *satyām* and *pratiṣṭhitām* appear as fem. This makes it necessary to supply *vācām* (going with *satyām*) from *vācā* occurring in the first half of the verse (*saccaṁ ve amatā vācā esa dhammo sanantano*). But would it not be more natural to reconstruct the line as *satyam arthe ca dharme ca*.... *pratiṣṭhitam* (neut.) since the first word, so far as it is legible, does not show the length of the vowel in the second syllable ? The Tibetan translation noted by LUEDERS on p. 22, f.n. 2 also points to *satyaṁ*....*pratiṣṭhitam*. Obviously LUEDERS suggested *satyāṁ* (*vācāṁ*) *pratiṣṭhitām* (fem.) because in the ms. F he found *vācaṁ*, cf. *satyam arthe ca dharme ca vācaṁ āhuḥ pratiṣṭhitām* as also in ms. x [*ca*] *dharme ca vācam* [*ā*]-. But in these manuscripts *vācam* has nothing to do with *satyam;* it is to be construed, together with *pratiṣṭhitām*, with *āhuḥ* which follows it immediately. Thus *satyam arthe ca dharme ca* (*iti*) *pratiṣṭhitām vācaṁ* (*santa*) *āhuḥ* would give good sense. With *vācam āhuḥ* we may compare *vācaṁ bhāseyya* and *bhāsatī vācaṁ*, Sutta-Nipāta 451 and 454; or *śiṣyam āha sthitaṁ pārśve Bhāradvājam idaṁ vacaḥ*, Rāmāyaṇa 1.2.20.

5. § 21, pp. 24-27 : Under cases of the misunderstood loc. sg. LUEDERS notes *bhūmivaḍḍhano* (Jātaka 538.51), nom. sg., which in his opinion should have been *bhūmivaḍḍhane*, loc. sg. (The line runs as—*nihato nūna me putto pathavyā bhūmivaḍḍhano*). LUEDERS starts from Pāli *vaḍḍheti* which, as rightly pointed out by him, is used about 'Aufhaüfen eines Breis in einer Schüssel'. Therefore, *bhūmivaḍḍhana*, according to him, means 'Erdanhäufung' or 'Grab'. This he connects with *nihato* which in his opinion is either a wrong translation of *nighāde* or a corruption of *nikhāto*. LUEDERS therefore translates the line as—'sicherlich ist mein Sohn in der Erde in dem Grabe eingegraben'.

This interpretation is not quite convincing. In the first instance, it compels us to presume that *nihato* is a wrong translation of *nighāde* or a corruption of *nikhāto*. Secondly, on this presumption *nihato* through *nikhāto* is to be derived from *ni√khaṇa*-[2] which is not very natural, because it seems difficult to separate *nihato* from *nihantvāna*[3] occurring in the first half of the verse (*ayaṁ so sārathi eti nihantvāna mam' atrajaṁ*) and LUEDERS does not seem to object to its derivation from *ni√hana*. Of course it can as well be said that *nihantvāna* is also a corruption of *nikhantvāna*, but this LUEDERS does not do. Thirdly, in this construction *nihato* and *bhūmivaḍḍhane* (actual text –*vaḍḍhano*) which are brought together stand very much apart. It may, therefore, be suggested that √*vaḍḍha* is here used in its usual sense 'to increase'. *vaḍḍhana* can then mean both increasing or causing to increase (Pā. 3.1.134), in the present instance the latter. *bhūmivaḍḍhana*, lit. 'one who increases the earth', may have been used as an euphimistic expression for a person buried in ground as thereby he may be regarded to cause the earth of the ground to increase. This may have been specially said of a person who was regarded as deaf, dumb, and a fool, and otherwise of no use to the people. The expression *pathavivaḍḍhanakakamma* which comes at the end of the instructions given by the king to the charioteer can also have similar meaning, 'the act of increasing the earth (by burying the prince in the ground)'. Thus *bhūmivaḍḍhano* as nom. sg. and adj. to *putto* seems quite satisfactory in the present verse.

6. § 37, pp. 38-39 : § 37—§ 86 are devoted to showing the cases where *l* in Pāli may be traced to the eastern influence. In the beginning, however, LUEDERS examines those instances which seem to be doubtful and where forms with *l* could be regarded as regular Pāli forms. To begin with in § 37 he takes the case of *gilati*: *girati* 'to swallow' about which he concludes—"Wie im Sk. können aber auch im Pāli *gilati* und *girati* nebeneinander bestanden haben."

The instances examined by LUEDERS in this article, however, seem to show that the two forms were not promiscuously used. In fact they show that the two forms were used to express opposite meanings. Thus

2. Forms of √*khaṇa* occur many times in Gāthās 3, 4, etc., and also in the prose narration. Hence it may be tempting to connect *nihato* with *ni√khaṇa*. It is, however, a little difficult to say why exactly here the corruption took place when forms of √*khaṇa* have been well preserved at other places in this Jātaka. But even if we regard *nihato* as a corruption of *nikhāto* or a wrong translation of *nighāde* (cf. *nighaññasi* in G. 8) it is not necessary to take *bhūmivaḍḍhano* as a mistake for –*vaḍḍhane*. With the meaning of *bhūmivaḍḍhana* here proposed the line can be translated as 'Indeed is my son, the increaser of the earth, buried in the ground'.

3. *nihantvāna* occurs also in Gāthā 52 and *nihaññamāno* in Gāthâs, 54, 55.

√*gila* (also when prefixed with *o, ni, pari*) was used to express 'to swallow', while √*gira* (with the prefix *ut*) gave the opposite sense 'to vomit, to spit out, etc.'. Therefore the proper Pāli word for 'to vomit' would be √*uggira* (with *r*) cited by LUEDERS from the Udāna II, 6, etc. (p. 39). When against this we get √*uggila* (with *l*) 'to vomit out' in Pāli (cf. Majjhimanikāya 1,393, Saṁyuttanikāya IV. 323, and Jātaka 436.4), then these may not be regarded as doubtful cases. They can be definitely looked upon as coming in Pāli due to eastern influence.[4]

According to the available dictionaries *ud*√*gil* never occurs even in Sanskrit in the sense 'to vomit out, to spit out, eject, etc.', to express which we have *ud*√*gir*. However, *udgāla* in the sense of 'vomiting out'. has been noted in the SCHMIDT'S *Nachträge* as occurring in the late work Yaśastilakacampū of Somadeva 1.94 and 3.180-181 (p. 434, line 1). But in both these cases the word occurs with *l* for the sake of alliteration.[5] Cf. *kaṇṭhāntaḥ-pravilagna-śalya-śakal-odgāla-skhalat-kukṣayaḥ* and *ghaṭadāsīnāṁ hi vadanasaurabhaṁ svāmitāmbūlodgālān*[6] *na saubhāgyabalāt*. (This alliteration in end syllables is continued also in the following phrases, cf. *prasūnavanasaṁsargān na nisargāt, bṛhadbhānubhāvān na svabhāvāt*, etc.). From the text, the word has also gone to the commentary while explaining the text-word *vigīrṇa* 1.82. cf. *tena vigīrṇā udgīrṇā udgālitā ye phenāḥ......Yamena pūrvaṁ mṛtakāni bhakṣitāni paścād udgālaḥ kṛta ity arthaḥ*. The word *udgāla* 'vomiting' is further noted in the Skt. lexicon Vaijayantī 183.126 (*udgālo vamathūdgārau*) only.

7. § 47, pp. 47-48 : LUEDERS discusses here *eḷamūga* in a group of allied words. The citations from the Pāli literature make it clear that *eḷamūga* means 'an idiot, a fool'.[7] As LUEDERS points out the word is not attested in Sanskrit literature[8] and the meanings given to *eḍamūka* by the Sanskrit Lexicons[9] do not help us at all in explaining the word. LUEDERS is

4. That seems to be the reason why the Burmese manuscripts show *uggīri* for *uggili* in Jātaka 436.4, mentioned by LUEDERS on p. 39, f.n. 3.

5. It is also possible that *udgāla* was being mixed up with *ud*√*gal* – 'to trickle out, drop out, etc.'That would also explain *uggaliadabbhakavalā miā* (*udgalitadarbhakavalā mṛgāḥ*) in the Śākuntala IV. 12.

6. SCHMIDT's equating *udgāla* with 'Geniessen von Ausgespieenem' with a question mark is obviously wrong.

7. The meaning 'deaf and dumb' given by DUTOIT in translating Jātaka 546 (II) 69 and 20 and seemingly supported by LUEDERS in f.n. 1, p. 48 by referring to Jātaka 546 (II) 13 is not supported as in the last instance the reading is not certain.

8. It may, however, be pointed out that *anelamūka*, as mentioned in the *Nachträge*, occurs in the sense 'taubstumm' in the Śrīkaṇṭhacarita 6.10, and probably in the sense 'stumpfsinning' in the Harṣacarita (1936) 28.2.

9. To the references given by LUEDERS may be added Rabhasa cited by the commentator on Amara 3.1.38, who also gives the meaning *śaṭha* for *eḍamūka*.

therefore, favourably disposed towards the suggestion made by BOEHTLINGK-ROTH in PW that Skt. *eḍamūka* contains *eḍa* 'sheep' and therefore it means 'dumb like a sheep'. LUEDERS further observes that the meaning 'idiot' attested in Pāli can be easily had from 'dumb like a sheep'. That is true; but being 'dumb' is not in any way a special characteristic of sheep and hence, while explaining the word it would not be sound to proceed from the meaning 'dumb like a sheep'. In fact the word seems to be definitely not known to old Sanskrit literature. Starting, therefore, from the surer meaning 'idiot' attested in Pāli literature it may be suggested that the latter part *mūga* of the compound *eḷamūga* may not have anything to do with *mūka* 'dumb', but that it may go back to Sk. *mūrkha* 'fool': *eḍamūrkha* > *eḷamukkha* > *eḷamukka* > *eḷamūka* > *eḷamūga*. The word would then literally mean 'fool or simpleton like a sheep'. In that case *eḍamūka* would appear as wrong Sanskritisation of Pāli *eḷamūga*.

So far as the form *mūka* < *mūrkha*[10] is concerned, instances of loss aspiration are witnessed both in Pāli and Prākrit, GEIGER § 62 (also § 40) cites *ikka* < *ṛkṣa*, *Takkasilā* < *Takṣaśilā*, etc.; PISCHEL § 213 gives *saṅkalā* Amg, JM, Ś < *śṛṅkhalā*, but *saṅkhalā* M, Ś, *śaṅkhalā* Mg, etc, and § 302 *sakkuli* and *saṁkuli* < *śaṣkuli; sukka* Amg, JM < *śuṣka*, but *sukkha* M, Amg, Ś, *śuska* Mg, etc. The change *k* > *g* occurs in Pāli, and it has been noted by LUEDERS as an eastern characteristic in § 87 and f.n. 1, GEIGER § 38. He also considers in § 122-§ 132 (see also p. 102, f.n. 2) certain cases of hyper-Pālism in which *k* appears for *g*. Thus from the formal point of view there is nothing objectionable in deriving *eḷamūga* from *eḍamūrkha*.[11]

Under *eḷa* in *eḷamūga* PTS Dictionary observes as follows :—"A rather strange use and explanation of eḷamūga (with reference to a snake "spitting") we find at J III.347 where it is explained as "eḷa-paggharantena mukhena eḷamūgaṁ", i.e., called eḷamūga because of the saliva (foam?) dripping from its mouth, v.l. elamukha." This explanation of the commentator is obviously mistaken. *eḷa* does not mean saliva or foam, and secondly this sounds a very strange description of a serpent. In the Gāthās the serpent is otherwise described only as *kaṇha, uggateja,*

10. LUEDERS does not discuss the loss of aspiration as a regional characteristic. It may be pointed out that in the inscriptions of Aśoka the loss of aspiration is noted in the Girnar version in the forms of the root $\sqrt{}$*tiṣṭh-*, cf. $\sqrt{}$*tiṣṭa* G, but *tiṭha* or *ciṭha* in other versions; also cf. *sesṭa* (*śreṣṭha*) G, but *sreṭha* Shah; Man., *seṭha* Kal; *gharasta* (*gṛhastha*) G, but *gahatha* Man., Kal., *grahatha* Shah, *gihitha* Top. The form *idha* in the Girnar version (and once in the Dhauli) as against *hida* of the remaining versions is the case of an old preservation.

11. Ś and Mg give *mukkha* (PISCHEL § 287), and *murukkha* is noted for the eastern language by Mārkaṇḍeya (§ 139) and Śaurasenī (§ 131).

and *āsīvisa*. The commentator was forced to explain away somehow *eḷamūgaṁ* as he took it to be an adjective of *uragaṁ*. The instances collected by LUEDERS in article § 47, however, show that *eḷamūga* at all places means 'a fool' and that it is used to characterise human beings and not animals. The present occurrence cannot be regarded as a solitary exception to the general use and hence it seems very likely that originally the word stood in the Gāthā as a vocative *eḷamūga*, an adjective of Brāhmaṇa.

Addressing the Brāhmaṇa as *eḷamūga* 'a fool' agrees well with the fact that in the Jātaka story the mind of the Brāhmaṇa was worried about the possible cause of his own death or that of his wife when he was himself unknowingly carrying a serpent in his bag. In Gāthā 1 he is, therefore, thus described—*vibbhantacitto kupitindriyo si*, DUTOIT—"Verwirrt ist dir der Geist, ängstlich der Sinn" (whence also the commencement of the Jātaka *vibbhantacitto ti*). The Gāthā in which *eḷamūgaṁ* occurs reads as :

ādāya daṇḍaṁ parisumbha bhastaṁ,
pass' eḷamūgaṁ uragaṁ dijivhaṁ/
chind' ajja kaṁkhaṁ vicikicchitāni,
bhujaṅgamaṁ passa, pamuñca bhastaṁ//

DUTOIT, "Nimm einen Stock und schlage auf den Ranzen;
du siehst die Schlange geifernd, doppelzüngig.
Gib heute auf die ängstlichkeit, den Zweifel;
sieh auf die Schlange, öffne deinen Ranzen!"

But as suggested above *eḷamūgaṁ* should be read as *eḷamūga* 'oh fool' referring to the Brāhmaṇa. *eḷamūga* (voc.) was subjected to the corruption *eḷamūgaṁ* (acc.) possibly because the metre required the fifth syllable to be long and also because the two words *uragaṁ dijivhaṁ* following *eḷamūga* were acc. sg. LUEDERS himself has put forward (§ 125, p. 103) a somewhat similar suggestion while explaining *ajakaraṁ* occurring in Jātaka 427.2. He suggests that *ajakaraṁ* may be regarded as a metrical emendation for *ajakara-* (just as in the present case it has been suggested to treat the reading *eḷamūgaṁ* as a metrical error for *eḷamūga*).

But the commentator's explanation interests us for another reason. How did he come to explain the latter part of the compound *eḷamūga* with the use of the word *mukha* ? For that speaks the v.l. *elamukha* which is the same as *eḷamukha*. Shall we therefore suppose that the commentator had before him the reading *eḷamukha* and hence he offered a curious explanation of the word with the use of the word *mukha* ? Actually, however, this *eḷamukha* in writing must have represented *eḷamukkha* (< *eḍa-*

mūrkha) (note that the metre requires the fourth syllable to be long) and herein we get further support for our suggestion that *eḷamūga* through *eḷamukkha* comes from *eḷamūrkha*.

Under *eḷamūga* (§ 47) LUEDERS does not treat the above passage. Perhaps he wanted to restrict his remarks in the present article to *eḷa* and discuss *mūga* later while dealing with the change $k > g$ (§ 87). This becomes evident from the following remarks of the editor given in f.n. 1 on p. 77—"Auf einem Zettel, der dem Papier und der Schrift nach älter als das eigentliche Manuscript ist, hat Lüders unter der Überschrift ‚*k* wird *g*' *mūga* und *eḷamūga* vermerkt. Für *eḷamūga* hat er dort die Bedeutung, ‚geifernd' gegeben und scheint bei diesem Ansatz an Wurzel *muc* gedacht zu haben." The meaning ‚geifernd' given to *eḷamūga* by LUEDERS obviously refers to the above passage. But this sudden change in the meaning is not warranted, and as shown above *eḷamūga* is used with reference to the Brāhmaṇa and not the serpent.

That *mūga* (< *mūrkha*) 'a fool' is not merely a supposition but has been actually used in Pāli can be shown at least from one passage in the Mūgapakkhajātaka (VI, 538). That in this Jātaka the usual word *mūga* = *mūka* 'dumb' is also used is clear from the following Gāthā 33 (p. 16) :—

nāhaṁ asandhitā pakkho, na badhiro asotatā/
nāhaṁ ajivhatā mūgo ......

DUTOIT, "Nicht bin an Gliedern ich ein krüppel,
nicht taub, weil kein Gehör ich habe,
nicht stumm, weil mir die Zunge fehlt;
...."

The word *mūga* occurs also in many other Gāthās (4, 5, 38, 58) in this Jātaka where it seems to be used in the sense of 'dumb'. The behaviour of prince Temiya as 'dumb' is also assured by the question put to him by the charioteer—*kasmā pituc ca mātuc ca santike na bhaṇī tadā* (Gāthā 32, also 61), DUTOIT, "Weswegen sprachst du früher nicht bei deinem Vater, deiner Mutter?", as also by the use of the expression *vissaṭṭhavacano* (Gāthā 58, 62) 'ganz frei vermag er ja zu sprechen' or 'der Stimme ist er mächtig' (DUTOIT) in describing the prince. But the fact that *mūga* = *mūrkha* 'fool' is also used in this Jātaka becomes clear from the last quarter of the Gāthā 33 cited above—(*nāhaṁ ajivhatā mūgo*), *mā maṁ m ū g a ṁ adhārayi*. DUTOIT renders the line as "(nicht stumm, weil mir die Zunge fehlt) ; erkenne mich nicht an als stumm". This rendering of *mūga* 'stumm' in the last quarter cannot be correct because there is no point in asserting twice that the prince, especially when he was speaking

the Gāthā himself, was not dumb. That he was not dumb has been already asserted in the first quarter of the second line, and now the word *mūga* coming again in the second quarter must have been used to deny some other supposed drawback in the prince. That this drawback was nothing but his feigned acting as a fool (hence here *mūga* = *mūrkha*) is shown by the very first Gāthā in this Jātaka where a goddess advised the prince to behave as—

mā paṇḍicciyaṁ vibhāvaya, b ā l a m a t o bhava sabbapāṇinaṁ/
sabbo taṁ jano ocināyatu, evaṁ tava attho bhavissati//

DUTOIT, "Nicht deine Weisheit lasse sehen,
als T o r werde geschätzt bei allen Wesen.
Das ganze Volk soll dich verachten;
so wird dein Zweck dir in Erfüllung gehen."

Similarly Gāthā 4 tells us that the prince was not only taken to be physically disabled but also as *a c e t a s a* 'u n v e r n ü n f t i g'. Later, when it was discovered that the prince was not really as he pretended to be, he was called *p a ñ ñ o* 'w e i s'. These references clearly show that the prince for some years not only behaved like deaf, dumb, and crippled but also as a fool.[12] That is the reason why having denied crippleness, deafness and dumbness in the first three quarters of the Gāthā, he asked the charioteer not to mistake him for a fool (*mā maṁ mūgaṁ* (= *mūrkhaṁ*) *adhārayi*) in the last quarter of the Gāthā.

Now that the meaning of *mūga* = *mūrkha* has been ascertained for Gāthā 33, it may be examined if in some of the other Gāthās also in this Jātaka *mūga* means not 'dumb' but 'fool'. In Gāthā 4 where *mūga* and *acetasa* both occur, *mūga* definitely stands for *mūka* 'dumb'. But in Gāthā 38 where only *mūga* and *pakkha* occur, though the prince had shown in all four deficiencies, it is possible that *pakkha* stands for the three physical disabilities (*mūga*, *badhira*, and *pakkha*), and that *mūga* stands for the mental one alone viz. foolishness (cf. *amūgo mūgavaṇṇena, apakkho pakkhasammato*). In Gāthā 58 we read *na so mūgo na so pakkho, vissaṭṭhavacano ca so*. Here if we do not regard *vissaṭṭhavacano* as a further elaboration of *na so mūgo* (*mūko*), then that expression alone

12. The prose portion immediately preceding Gāthā 1 tells us that the goddess told the prince to act as a fool by taking recourse to the three physical deficiencies of crippleness, deafness, and dumbness :—*apīṭhasappī yeva pīṭhasappī viya hohi, abadhiro badhiro viya hohi, amūgo va mūgo viya hohi* (printed as *hoti*), *imāni tīṇi aṅgāni adhiṭṭhāya paṇḍitabhāvaṁ mā pakāsayi* (DUTOIT, ".... so werde, obwohl du kein verwachsener krüppel bist, wie ein verwachsener krüppel; obwohl du nicht stumm bist, sei, als wärest du stumm; obwohl nicht taub, stelle dich taub. Indem du diese drei Merkmale zeigst, verrate nicht deine weisheit.")

would declare that the prince could speak clearly. In that case *mūga* (=*mūrkha*) and *pakkha* in the first quarter would be contrasted, as in Gāthā 38, as referring to the mental and physical deficiencies.[13] In Gāthā 5, the meaning of *mūga* is doubtful; but as it stands by the side of *badhira* 'deaf', it may there have meant 'dumb'.

Now as regards the meaning of *mūga* = *mūrkha* in relationship with *eḍa,* it would be good to start with some of the observations of EDGERTON in BHS Dictionary. Under *eḍaka-mūka* we read—"Here perhaps the literal idea, *speechless,* is dominant, tho the parallel jaḍa-samena suggests that overtones of *dull, stupid* must also be present". For *eḍamūka* EDGERTON gives the meaning '*stupid* (lit. *dumb*) *as a sheep*'.[14] But as has been shown above the word just *literally* means 'stupid as a sheep' and not 'dumb as a sheep', and originally at any rate *mūka* (< *mūrkha*) in this compound had nothing to do with *mūka* = dumb. At the close of his remarks under *eḍamūka,* EDGERTON observes, "Sheep are proverbially stupid in other countries than India."

This remark appears to be almost correct as stories showing the stupidity of sheep are ordinarily not known from Indian literature. However, so far as the proverbial stupidity of sheep is concerned we may do well to refer to a popular *nyāya* called *ajākṛpāṇīya* which has been cited in the Kāśikā under P. 5.3.106 (together with *kākatālīya* and *andhakavarttakīya*). It has been taken there to convey the idea of an unexpected happening, a surprising event (*atarkitopanataṁ citrīkaraṇam ucyate*—Kāśikā).

As regards the interpretation of this *nyāya* we get the following information in the Laukikanyāyāñjali (A Handful of Popular Maxims, Part I) collected by Colonel G. A. JACOB (2nd edn., Bombay, 1907, p. 1): The maxim of *the she-goat and the sword.* It is founded on some story of a goat's being suddenly killed by accidental contact with a sword, and is used to illustrate any surprising event happening altogether by chance. It, therefore, belongs to the same class as *kākatālīya, khalvāṭabilvīya* and others of a similar kind. An excellent illustration of its use is found on page 229 of Śrîharsha's *Khaṇḍanakhaṇḍakhâdya* :—*pāṇau pañca varāṭakān pidhāya kaścit pṛcchati kati varāṭakā iti/ pṛṣṭaś cājākṛpāṇīyanyā-*

13. It may further be pointed out that perhaps the title of the jātaka *mūga-pakkha* also is intended to show similar contrast between *mūga* (foolishness) and *pakkha* (physical disabilities) and hence there too *mūga* possibly stands for *mūrkha*.

14. To quote LUEDERS again from the end of § 47 (p. 48), "Die im PW. ausgesprochene Vermutung, dass *eḍamūka* das gewöhnliche Wort für ‚Schaf', *eḍa*, enthält, also ‚stumm wie Schaf' bedeutet, ist daher nicht von der Hand zu weisen. Die für das Pāli gesicherte Bedeutung ‚Idiot' würde sich leicht daraus ableiten lassen."

yena bravīti pañceti/ In a footnote the maxim is thus explained :—*kaṇḍūyanārthaṁ stambhādau śithilabandhakhadge chāgī grīvāṁ prasārayati yadṛcchayā ca grīvā chidyate*[15] *tathābhūto 'jākṛpāṇīyanyāyaḥ kākatālīyanyāyasamaḥ/* Vardhamâna puts it differently in his comment on Gaṇaratnamahodadhi iii.196:—*yathājayā bhūmiṁ khanantyātmavadhāya kṛpāṇo darśitas tattulyaṁ vṛttaṁ kenacid ātmavināśāya kṛtam ajākṛpāṇīyam/*"

It appears that both the explanations given above are based on different versions of the same story. The first explanation makes the death of the sheep altogether accidental as it is shown to result from the fall of a sword loosely tied to a post or some such thing. The second explanation, on the other hand, allows the room for accident only upto the point that a sword hidden in the ground was accidentally brought to the notice of some one who was probably looking for it and who having found it killed the sheep with it. The expression *ātmavināśāya* seems to suggest the stupidity of the sheep in being responsible for bringing the knife to light. Both these motifs are brought together in a version of the story which is preserved in the Takkāriyajātaka (481). The occasion at which the story was narrated shows that it was intended to illustrate the foolishness of the sheep. A Brāhmaṇa named Takkāriya had almost succeeded in bringing about the death of the paramour of his wife. But as he foolishly rushed to reveal the plan to his wife he himself fell a prey to his trick. To this foolish behaviour on the part of the Brāhmaṇa a reference is made in the opening line of the Jātaka which forms part of the Gāthā (1) placed in the mouth of Takkāriya. It describes the Brāhmaṇa a *b ā l a* 'a fool'. cf. *aham eva dubbhāsitaṁ bhāsi b ā l o* (DUTOIT, "Ich sagt', ich Tor, was ich nicht sagen sollte"). As Takkāriya stood there with the threat of death on his head, his pupil began to narrate to him how others also had suffered death on different occasions for having acted foolishly or for not having guarded their speech. Among the four stories told by the pupil, the first one describes a merchant's son bringing misfortune to himself by not controlling his tongue and rendering unnecessary advice. In the other three stories death came to those who did some foolish acts. Among these occurs the story of a sheep which was

15. The commentary Padamañjarī on Kāśikā 5.3.106 gives also somewhat similar explanation, but it makes the death of the sheep more accidental as it makes no reference to the scratching of the neck by the sheep, cf. *ajāyā gacchantyāḥ kṛpāṇenādhaḥpatatā yathā vadhas tatsadṛśam ityarthaḥ/ The Pandit*, Vol. XVII.367 (Benares, 1895). Some such explanation was also known to the authors of the Tattvabodhinī and the Bālamanoramā commentaries on the Siddhāntakaumudī. Accidental death of a goat is also referred to in the Jātaka 18, where the mishap is said to have occurred due to a piece of stone which sprang as a result of a lightning-stroke.

stolen by some thieves and which they wanted to kill and eat the next day. The next day, however, when they went to the bamboo-grove where they had concealed the sheep the night before, they forgot to take a knife with them. They, therefore, in a pious mood released this sheep, which in joy began to jump here and there. Just then it struck against a bamboo tree where a bamboo-cutter had kept his knife. The knife fell down and the thieves having come to know of it killed the sheep with this knife and ate it. Thus it suffered death by its own foolish act. The Gāthā (6) referring to this story is slightly different from the above account which is based on the prose narrative. It makes no direct reference to the thieves who are supposed to have made use of the knife to kill the sheep.

ajā yathā veḷugumbasmiṁ baddhā
avekkhipantī asik' ajjhagañchi/
ten' eva tassā galak' āvakantaṁ
ayam pi attho bahu tādiso vā//

DUTOIT, "'Ne Ziege, die in einem Bambusdickicht war
gebunden, stiess beim Hüpfen an ein Messer.
Mit diesem schnitten sie den Hals ihr ab.
Dies bracht' etc."

Apparently a similar story but with a clear reference to the digging up of the knife from the ground (cf. the explanation of Vardhamāna given above) is referred to in the Mbh 2.59.8 (critical edition) and has been discussed by EDGERTON in *JAOS* 59.366-68 (1939).[16] He has also referred to the *ajākṛpāṇīya* and the Jātaka story (481) mentioned above. The verse and its translation as given by EDGERTON run as—

ajo hi śastram akhanat kilaikaḥ
śastre vipanne padbhir apāsya bhūmim/
nikṛntanaṁ svasya kaṇṭhasya ghoraṁ
tadvad vairaṁ mā khanīḥ pāṇḍuputraiḥ//

"For it seems that a certain goat dug up a knife, when the knife was lost, knocking away the earth with his feet,—(and so dug up) a cruel cutting of his own throat. In this manner do not you dig up enmity with the sons of Pāṇḍu!" The purpose of referring to the story of the sheep is clearly to warn the Kauravas not to do any foolish act which would lead to their own destruction. While mentioning the different versions[17] of the story EDGERTON observes (p. 367), "All versions agree in treating the story as

16. I am indebted to my friend Dr. A. M. GHATAGE for his kind information about this article.

17. The Mbh. verse occurs at 2.66.8 in the Bombay edition where Nīlakaṇṭha alludes to two versions of tha story. They are, however, not very helpful for our purpose.

an instance of a mishap brought upon its victim by his own *stupid* (italics ours) action."

The basis of the *ajākṛpāṇīya* thus seems to be in a story which was intended to show the foolishness of the sheep. Though later on this maxim came to be classed with others like the *kākatālīya* referring to accidental occurrences, originally it alluded only to the foolish act of the sheep and intended to illustrate deaths brought about by one's own stupid acts. This would, therefore, justify our suggestion to take *eḷamūga* (voc.) as going with the Brāhmaṇa in the Jātaka III.402 (p. 347). The Brāhmaṇa was called *eḷamūga* 'fool like a sheep' because he was likely to bring about his death by his own foolish act of carrying the serpent in his bag.

8. § 82, pp. 70-72 : LUEDERS is absolutely correct when he says that the difference in the forms *sithila* Dhammapada 346 and *susthira* Udānavarga 2.6 can be explained only when we presume, that both of them come from a common base in the eastern dialect. I, however, believe that the explanation of the difference in the two forms has to be given in a way different from the one given by LUEDERS.

In Dh. 346, *sithila* (*śithila*) 'locker' occurs as an adj. to *bandhana* 'fetter'. As in the same stanza this *bandhana* is also described as *daḷha* (*dṛḍha*) 'fest':

etaṁ daḷhaṁ bandhanam āhu dhīrā
ohārinaṁ sithilaṁ duppamuñcaṁ /

LUEDERS regards the use of *sithila* = *śithila* as 'sinnlos'. The explanations of *śithila* given by the commentators are no doubt forced.[18] Moreover LUEDERS points out that *sithilaṁ* is metrically irregular because the fifth syllable in the Pāda is required to be long (*ohārinaṁ sithilaṁ*). Now in the parallel passage in the Udānavarga 2.6, we find *susthira* 'dauerhaft' which agrees well with the adj. *dṛḍha* applied to *bandhana*.

etad dṛḍhaṁ bandhanam āhur āryāḥ
samantataḥ susthiraṁ duṣpramokṣam /

LUEDERS, therefore, concludes that the original text in the eastern language must have had *suṭṭhila* (< *susthira*), written as *suṭhila*. This was probably corrupted to *saṭhila* which the Pāli translator mistook for *sithila*. The mistake of the Pāli translator arose because in Pāli we have *saṭhila* also corresponding to Skt. *śithila*. The Sanskrit translator of the

18. "—— dass eine solche Fessel locker zu nennen sei, da sie Haut und Fleisch nicht zerschneide, kein Blut hervortreibe und die Fesselung nicht empfindén lasse..."

Udānavarga, on the other hand. rendered the eastern form *suṭhila* correctly by Skt. *susthira*.

But let us first look at the nature of the *bandhana* here described. It is the fetter in the form of attachment to worldly pleasures which are detailed in the stanza before (Dh. 345) as *maṇikuṇḍalesu puttesu dāresu ca yā apekhā* (Hängen an äuserem Schmuck und der Sorge um Weib und Kinder) and which are in a general way referred to as *kāmasukhaṁ* in the present stanza (346) or as *kāmasya bandhanaṁ* in the Tibetan version of the parallel passage in the Udānavarga 2.6 (cited by LUEDERS, on p. 72). In these two verses it is this *kāmabandhana* then which is sought to be contrasted with the other fetters of iron, etc. mentioned in Dh. 345 and which the wise do not regard to be as *daḷha* as the *kāmabandhana*. cf.

na taṁ daḷhaṁ bandhanam āhu dhīrā,
yad āyasaṁ, dārujaṁ, pabbajañ ca; (345)

Max MUELLER, "Wise people do not call that a strong fetter which is made of iron, wood or hemp." Then it is said in verse 346 that, *etaṁ daḷhaṁ bandhanaṁ āhu dhīrā* etc. In this context therefore *daḷha* (*dṛḍha*) does not seem to mean 'fixed or firmly fastened', but only 'strong, hard'. It would not then be 'sinnlos' if a *bandhana* is called *śithila* and *dṛḍha* in the same breath. A fetter can be loose and still so strong that it is difficult to break it. It is from this point of view that the *kāmasukhabandhana* in our stanza is called *sithilaṁ*, but at the same time *duppamuñcaṁ*, or as the Tibetan version puts it *śithilam api duṣpramokṣam* where the contrast between *śithila* and *duṣpramokṣa* is clearly brought out by the addition of the particle *api*. That the fetters of love are tender and loose and yet strong as they are difficult to be got rid off is well known from ancient literature. To quote the following verse from the Subhāṣitaratnabhāṇḍāgāra p. 390.511—

bandhanāni kila santi bahūni premarajju dṛḍhabandhanam uktam/
dārubhedanipuṇo 'pi ṣaḍaṅghrir niṣkriyo bhavati paṅkajakośe//

Here it would be futile to say that the *bandhana* of the lotus flower is tight or immovably fixed on the bee. It is loose and tender also; but at the same time it is strong (*dṛḍha*) enough for the bee!

That *dṛḍha* and *śithila* are not incompatible can also be seen from the following passages to which reference is made in the PW. The Taitt. Saṁ. 3.2.4 gives certain mantras to be repeated when the sacrificer creeps towards the *sadas*. In the third section (3.2.4.3) occurs a mantra which according to the commentator Mādhava is addressed to heaven and earth. The mantra runs as—*dṛḍhé sthaḥ śithiré samīcī mām-*

hasas pātaṁ/[19] "You two who are strong and loose, being united protect me from misery". The commentator explains it as—*he dyāvāpṛthivī upasthānarahitaṁ prati śithile api yuvām upasthātāraṁ prati samīcī anukūle satyau dṛḍhe sthaḥ*. The same two adjectives *dṛḍha* and *śithira* are also used in the Ait. Br. 13.7 with regard to the joints of a human body. Here an explanation is sought to be given for the repetition of the call '*śoṁsāvoṁ*' twice, once before and once after the *dhāyyās* inserted in the Vaiśvadeva śastra. About this it is said—*yathā vai puruṣa evaṁ Vaiśvadevaṁ, tasya yathāvāntaram aṅgāny evaṁ sūktāni, yathā parvāṇy evaṁ dhāyyās, tad ubhayato dhāyyāṁ paryāhvayate, tasmāt puruṣasya pārvāṇi śithirāṇi santi dṛḷhāni brahmaṇāhitāni dhṛtāni*. "The Vaiśvadeva Śastra is like a man; just as he has in him limbs, so are the hymns (in the Śastra); just as he has joints, so are the inserted verses; now he repeats the *āhāva* on both sides of the inserted verses; therefore the joints of a man (though) loose, are strong, (because) they are placed on, held together by *brahman* (in the form of *āhāva*)". Sāyaṇa, however, explains —*tathā sati dhāyyā ubhayapārśvaparvāṇi śithirāṇi pūrvaṁ śithilāni santy api paścāt prayatnena dhāritāni dṛḍhāni sampadyante*.[20]

Having thus seen that *daḍha* and *sithila* are not necessarily incompatible, and that *sithila* is justified in view of the fetter being *kāmabandhana*, we may turn to another adjective *ohārinaṁ*[21] given to the *bandhana* which will also support the view that *sithila* = *śithila* was really intended. For the use of these two adjectives together, support is given by the reading *ohariṇa śiśila* in the Kh. Dh. and by *ohārinaṁ sithilaṁ* occurring in the Saṁyutta-Nikāya 1.77 and Jātaka 201.2 where the same stanza appears. Thus so far as the Pāli and the Kharoṣṭhī traditions are concerned this reading is confirmed. The expression *ohārinaṁ* as an adjective of *bandhanaṁ* has been translated as 'niederziende' which, according to LUEDERS

19. The Āp. Śr. Sū. 12.20.4 and the Baudh. Śr. Sū. 7.10 give the mantra which has *dṛḍhe sthaḥ śithire samīcī*. But in the mantra given in the Mān. Śr. Sū. 2.3.7.2 we find *aśithire* for *śithire* possibly because it was felt that *dṛḍhe* and *śithire* cannot go together. For references see BLOOMFIELD, *Vedic Concordance* and KEITH'S translation of the Taittirīya Saṁhitā, part I, p. 242, footnote 4.

20. In the Ait. Br. 28.8, while justifying the recitation of Śilpas at the end of the Nārāśaṁsa Śastra of the third pressing, the word *dṛḍha* seems to be intended in its two senses viz. hard and fixed, so that once it contrasts with *mṛdu* 'soft' and once with *śithira* 'loose'; cf. *athaitan mṛdv iva cchandaḥ śithiraṁ yan Nārāśaṁsam, athaiṣo 'ntyo yad acchāvākas tad dṛḷhatāyai dṛḍhe pratiṣṭhāsyāma iti*, "Now this Nārāśaṁsa hymn is as though soft, (as though) loose. (But) when the Acchāvāka comes at the end that is for the sake of hardness and fixity. (They do it thinking) let us establish it on something hard and firm."

21. This is not found in the Tibetan version which has also nothing to correspond to *daḷhaṁ*.

himself, is 'nicht ganz sicher'. He is, however, prepared to content himself with the explanations of the commentators, viz. that 'die beschriebene Fessel in schlechte Wiedergeburten hinabziehe'. The explanation is far-fetched and is offered in view of the metaphorical sense of the *bandhana* viz. attachment to worldly pleasures. But to me *ohārinaṁ* seems to be a corruption of *oharinaṁ* 'falling or slipping down' which suits excellently with the adjective *sithila*. As the fetter is loose it slips down again and again like a bracelet. With this can be compared favourably the description of the king's golden bracelet in act III.12 of the Śākuntala. As king Duṣyanta had become imatiated his bracelet had become loose and he used to push it back. From there, however, it used to slip down to the wrist and the king was required to push it back again and again—*anabhilulitajyāghātāṅkaṁ muhur maṇibandhanāt kanakavalayaṁ srastaṁ srastaṁ mayā pratisāryate*. *Oharinaṁ* was slightly changed to *ohārinaṁ* possibly because the metre required the second syllable to be long. Afterwards *ohārinaṁ* was kept on because it was understood in some such manner as given by the commentators. The translator responsible for the Ud. varga probably had before him the uncorrupted form *oharinaṁ*. But since he rendered *suṭhila* of the original by *susthira* 'fixed', he found it difficult to combine it with *oharinam* 'slipping down' and hence he was forced to replace it by an altogether different word *samantataḥ*. This latter word, from the point of view of meaning, is superfluous and it constitutes a major deviation from the Pāli and the Kharoṣṭhī versions as they have nothing to correspond to *samantataḥ*.

Having ascertained that *sithilaṁ*, corresponding to Skt. *śithilam*, represents the original reading, let us look at it from the point of view of form. Pāli *sithila*=Vedic *śithila* have been traced back to **śṛthila*. This would give in the eastern middle Indian dialect *saṭhila* as in this dialect *ṛ* normally becomes *a* and the dental following *ṛ* is cerebralised. LUEDERS is therefore perfectly justified when he considers *saṭhila*, which occasionally appears also in Pāli, to be an eastern form. Now it has been pointed out that the eastern dialect shows a preference for the vowel sequence *u i a* in words having more than two syllables (cf. p. 38 where LUEDERS cites *pulisa*, *munisa* from Aśokan inscriptions). In that case it would not be wrong if we suppose that in the eastern dialect **śṛthila* gave rise also to *suṭhila* (*u i a*) by the side of *saṭhila* noted above. And in fact the Udānavarga reading *susthira* (*u i a*) proves that this was really the case. It is thus clear that the original eastern version used *suṭhila* (<**śṛthila* 'loose') which was mistaken by the Sanskrit translator of the Udānavarga to be *susthira*, but which was correctly understood to represent *śithila* in the

Pāli, Kharoṣṭhī, and also that Sanskrit version which served as the basis for the Tibetan translation of the Udānavarga.[22]

We are thus lead to a conclusion totally different from that of LUEDERS. We see that the mistake was committed by the Udānavarga translator and not by the others. It may be added that perhaps the metre contributed to the mistake for it required the fifth syllable to be long and hence *suṭhilaṁ* of the original was in some recension pronounced as *suṭṭhilaṁ* (to make *su* metrically long). The explanation here given of *sithila* : *susthira* has further the advantage that it does not compel us to assume that the original reading was corrupted to *saṭhila*.

9. § 84, pp. 74-75 : In § 84 - §86 LUEDERS gives certain very interesting instances of word-plays which can be better appreciated when one presumes that the original text from which the Pāli verses were translated had certain words with *l*. Thus for example in the Sutta-Nipāta 535, which tells us who, according to the Buddha, can be called *ariya* (*ārya*), LUEDERS points out that in the original eastern text there must have stood the word *āliya* (with *l*) for Pāli *ariya*. This has been suggested because *āliya* is nearer in sound to *ālaya* 'desire' used in the first line of this verse.

This conclusion of LUEDERS may be accepted but we have some other things to suggest with regard to the interpretation of the verse. The first two lines of the verse read—

chetvā āsavāni ālayāni
vidvā so na upeti gabbhaseyyaṁ /

FAUSBOELL, "Whosoever, after having cut off passions and desires, is wise and does not (again) enter the womb........"

But the use of *chetvā* from √*chida* 'to cut off' with *āsavāni* is strange. The root meaning of *āsava* (= **āsrava*) is 'that which flows' and this is not something that can be cut off. It is a thing that is to be destroyed in that it is gradually wasted away. That is the reason why we often get the use of *khaya* (*kṣaya*) 'extinction' and *khīṇa* (*kṣīṇa*) with *āsava*.[23] In conformity with this usage one anticipates in the above verse

22. This is important because as mentioned by LUEDERS himself the Tibetan translation often points to a Skt. text which is older than the vulgate of the east Turkestan manuscripts of the Udānavarga. LUEDERS who believes *suṭṭhila* = *susthira* to be the original reading, finds it therefore difficult to reconcile his view with *śithilaṁ* of the Tibetan version. "Schwerer wiegt" he observes, "dass die tibetische Version des Udānavarga, die zweifellos eine Übersetzung des Sanskrittextes ist, ebenfalls die Lesart *śithilaṁ* kennt."

23. cf. PTS Dictionary under *āsava*, *khaya* and *khīṇa*, and also BHS Dictionary under *āsrava*.

a form of the verb √*khayati* (*kṣayati*) 'to destroy, etc.,' with *āsava*, and in fact it is possible to derive *chetvā* from √*kṣi*. As is well known in the western dialect of the inscriptions of Aśoka Skt. *kṣ* is represented as *ch*. Hence in that dialect we can get a gerund *chetpā* from √*kṣayati*.[24] The Pāli correspondent of this western *chetpā* would be *chetvā* (or *chetvāna*) which occurs in our verse. In *chetvā āsavāni* 'having destroyed the *āsavas*', therefore, the former is not to be confused with *chetvā*, the gerund from √*chida*. Not realising this but feeling at the same time that *chetvā* from √*chida* 'to cut off' does not go well with *āsava*, the Burmese scholars made an unsuccessful attempt to mend the matter by transposing the words *āsavāni* and *ālayāni* and reading the line as *chetvā ālayāni āsavāni*.[25]

Against the proposed derivation of *chetvā* from √*kṣi* in *chetvā āsavāni* it cannot be argued that sometimes we get the expressions *sotaṁ chetvā* or *chinnasota* where *sota* <*srótas* also means 'a stream or flood' and where *chinna* and hence *chetvā* have undoubtedly to be derived from √*chida*. For in these cases √*chida* does not mean 'to cut off or to destroy', as it has been erroneously assumed, but it means 'to cut across i.e., to cross over, to go beyond, etc.' This is made perfectly clear by a passage in the Majjhimanikāya 1.225-26 where it is said about a cowherd who successfully carried his herd across the current of the river Ganges as— ....*vassānaṁ pacchime māse saradasamaye* ....*titthen' eva gāvo patāresi uttaran tīraṁ*.... . *te tiriyaṁ Gaṅgāya sotaṁ chetvā sotthinā pāraṁ agamaṁsu*. "In the last month of the rainy season, in autumn, he carried his cows to the other shore with the help of a ford. They having crossed the current of the river Ganges safely reached the opposite shore." Here *chetvā* cannot mean 'having destroyed the stream, etc.' Obviously the same meaning of √*chida* 'to cross over' is also intended when on the basis of the above illustration it is told to the assembly

24. For the treatment *kṣ* > *kh* and *ch* in Pāli cf. GEIGER § 56. The eastern counterpart of the western *chetpā* would be *khettu*.

25. This seems to be the real ground for the transposition of the words and not, as LUEDERS observes, while in the verse *ariya* and *ālaya* are brought into relationship by a play on words. cf. "In unserer Strophe wird *ariyo* mit *ālayāni*, den Lüsten, die der *ariya* vernichtet hat, in Verbindung gebracht. Dass es darauf ankommt, haben die birmanischen Gelehrten erkannt, und aus diesem Grunde ist in den birmanischen Handschriften *ālayāni* vor *āsavāni* gestellt worden." The Mahāvastu translator (III.400.3 f.) also seems to have felt the difficulty in connecting *chetvā* (from √*chid*) with *āsavāni* and *ālayāni* and hence he tried to get over it by substituting *hitvā* for *chetvā* and also adding *bandhanāni* as a gloss to *āsavāni* and *ālayāni* (p. 75, f.n. 1). cf. *hitvā ālayāni āsayāni bandhanāni ativṛtto neti*. It may be added that the regular BHS gerund from √*hā* 'to abandon' would be *jahitvā*, cf. EDGERTON, *Language* 13.117 (1937).

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of monks—*ye te bhikkhū arahanto khīṇāsavā... te pi tiriyaṁ Mārassa sotaṁ chetvā sotthinā pāraṁ gatā* (M.I. 226).[26]

Proceeding from the above passage it would be legitimate to conclude that as in *sotaṁ chetvā* so in *chinnasota* also *chinna* means 'one who has crossed' and not 'one who has cut off (the stream)'. That this is in fact the case can be gathered from the following occurrences :—

In Sutta-Nipāta 715 we read,

yassa ca visatā n'atthi
chinnasotassa bhikkhuno /

FAUSBOELL, "for whom there is no desire, for the Bhikkhu who has cut off the stream (of existence) ...." However here *chinnasota* does not mean 'who has cut off', but 'who has crossed the stream'. This is shown by the fact that in the preceding verse (714) we read,

na pāraṁ diguṇaṁ yanti

FAUSBOELL, "....they (i.e. the Samaṇas) do not go twice to the other shore...."

Again in Sutta-Nipāta 948 we find,

yo 'dha kāme accatari
saṁgaṁ loke duraccayaṁ /
na so socati nājjheti
chinnasoto abandhano //

FAUSBOELL, "whosoever, has here overcome lust, a tie difficult to do away with in the world, he does not grieve, he does not covet, having cut off the stream, and being without bonds." That here too *chinna* can only mean 'one who has gone beyond' is shown by the use of the expressions *accatari* (from *ati*√*tara* 'to go beyond, to cross') and *duraccayaṁ* (from *dur* + *accaya* 'difficult to cross'). (Note also that in the Sutta-Nipāta 945 *kāmapaṅka* is described as *duraccaya* where the commentary explains it as *duratikkamanīya*). This will also be clear from Itivuttaka 5.6 (p. 95) where *chetvā sotaṁ duraccayaṁ* can only mean 'having crossed the stream which is difficult to cross'.

In Dhammapada 383 we have,

chinda sotaṁ parakkamma
kāme panuda brāhmaṇa /

26. We may compare with this *oghatiṇṇa* and *oghātiga*, PTS Dictionary s.v.

Max MUELLER, "Stop the stream valiantly, drive away the desires, O Brâhmana !"[27] However, in this instance we have not to think of the stopping or cutting off of the stream but of its crossing. This is shown by the next verse (384) where the idea of 'going beyond', though in a different sense viz. 'to accomplish, to have perfection in, etc.', is similarly present.

yadā dvayasu dhammesu pāragū hoti brāhmaṇo/

Max MUELLER, "If Brâhmana has reached the other shore in both laws (in restraint and contemplation....'"[28] Moreover in the same *varga* of the Dhammapada occurs another verse (414) which leaves no doubt about the way in which *chinda sotaṁ* in verse 383 has to be interpreted. Verse 414 reads as—

yo imaṁ palipathaṁ, duggaṁ, saṁsāraṁ, mohaṁ accagā,
tiṇṇo pāragato, jhāyī, anejo akathaṅkathī,
anupādāya nibbuto, tam ahaṁ brūmi brāhmaṇaṁ /

Max MUELLER, "Him I call indeed a Brâhmana who has traversed this miry road, the impassable world and its vanity, who has gone through, and reached the other shore, is thoughtful, guileless, free from doubts, free from attachment, and content".

In the end we may refer to Saṁyutta-Nikāya IV. 291 where *chinnasota* is used as an adjective of a chariot (*ratha*) and hence can only mean 'which has crossed the stream'. cf. *anīghaṁ passa āyantaṁ chinnasotaṁ abandhanaṁ.* Here LUEDERS (p. 49) also follows the traditional translation of *chinnasota* when he renders the line as, 'Sieh den Unerschütterten kommen, der die Flut der begierden abgeschnitten hat, den Fessellosen."

Thus it will be clear that in those passages where *sota* and forms of √*chida* are brought togeher the idea to be conveyed is of 'crossing the stream' and not of ' cutting it off or destroying it'.[29] It may then be argu-

27. The same line recurs in Saṁyutta-Nikāya 1.49 which Mrs. Rhys DAVIDS translates as, "Advance with valiant energy, recluse, cut off the stream, scatter desires of sense". (*Kindred Sayings*, I.70).

28. It may be added that the idea of crossing the stream also continues in the following verse (385) which, however, is difficult to interprete. Read—*yassa pāraṁ apāraṁ vā, pārāpāraṁ na vijjati......tam ahaṁ brūmi brāhmaṇaṁ.//* Max MUELLER, "He for whom there is neither this nor that shore, nor both, him....I call a Brâhmana."

29. Where the idea of drying up of waters is to be conveyed we meet with the use of *khīṇa* and not *chinna* with *sota.* cf. *macche va appodake khīṇasote* (Sutta-Nipāta 777), FAUSBOELL, 'like a fish in a stream nearly dried up, with little water'. The use of *ud* √*chid* in the sense of 'to break off, to stop, to want' is noted in PW where a passage cited from the Pañcatantra II.92 shows its use with *kusarit.* cf. *arthena tu vihīnasya puruṣasyālpamedhasaḥ/ ucchidyante kriyāḥ sarvā grīṣme kusarito yathā//* But this use of *ud*√*chid* does not disprove our argument.

ed that in *chetvā āsavāni* also we may understand 'having cut across, i.e., having crossed the *āsavas*', instead of 'having destroyed the *āsavas*'. But with *āsavas* the idea is clearly not 'to cross' them but 'to waste them away, to destroy them' as shown by the frequent use of *khaya* or *khīṇa* with *āsava*.[30] Hence it seems desirable that in our passage *chetvā* is not to be derived from √*chida*, but from √*kṣi* as explained above.

The attempt of the Burmese scholars to improve matters by transposing *āsavāni* and *ālayāni* has been described above as 'unsuccessful' because just as *chetvā* from √*chida* does not go well with *āsavāni* it does not go well with *ālayāni* either.[31] The new meaning of *chetvā* < √*kṣi* suggested above also does not quite fit in with *ālayāni* because the original meaning of the word *ālaya* is 'abode, house'. This compels us to look for some other gerund which can be connected with *ālayāni*. This can only be the immediately following word *vidvā*. It may, therefore, be proposed to take *vidvā* = Sk. *viddhvā* a gerund from √*vijjha* (√*vyadh*) 'to pierce, etc.' The PTS Dictionary notes a poetical gerundive *viddhā* (*khattiyo brāhmaṇo vesso ko maṁ v i d d h ā nilīyasi*—Jātaka 540.1) which also has to be derived from *viddhvā* by assimilation. EDGERTON (*Buddhist Hybr. Skt. Gr.* § 35.28) notes an absolutive *viddhitvā*, Mahāvastu 1.12.5 which leads to a base *√*viddhati* (cf. § 28.19). *viddhitvā* is obviously a middle Indic gerund in—*itvā* for *viddhvā* as the metre required a word with three syllables.

As regards our form *vidvā* < *viddhvā* by loss of aspiration, one may refer to such parallels as Pāli *ludda* < *luddha* < *lubdha* (suggested by LUEDERS § 77 and already by GEIGER § 62), *khudā* < *kṣudhā* (GEIGER § 40 who also gives a few other instances), and *lodda* < *loddha* < *lodhra* (GEIGER § 62). If *vidvā* is taken as a gerund from √*vyadh* it can be easily construed with *ālayāni*, the original meaning of which is 'abode, etc.', and then also 'desire, etc.', With the use of √*vijjha* with *ālaya* 'abode, house, etc.', we may compare Sutta-Nipāta 516—*nibbijjha imaṁ parañ ca lokaṁ kālaṁ kaṅkhati bhāvito sa danto*.[32]

In FAUSBOELL'S translation cited above *vidvā* is rendered 'wise'. Perhaps the word is used in a double sense, once as a substantive and once

30. It is worth noting that in the explanation given on p. 292 of the passage from the Saṁyutta-Nikāya IV. 291 cited above *khīṇa* is used with *āsava* and *chinna* with *sota*. cf. *tasmā khīṇāsavo bhikkhu chinnasoto ti vuccati*.

31. Though in justice to the Burmese scholars it may be said that of the two *āsavāni* and *ālayāni*, *chetvā* from √*chida* would be better construed with *ālayāni*. cf. *chinnālayattā* Jātaka 539.24.

32. Actually the word used in the citation is *loka* and not *ālaya*. With *ālaya* we have also *samud* √*han* in *ālaya-samugghāta* Visuddhimagga 293.9, 25f, 407.27-28, and *ālaya-samudghāta* Mahāvastu 3.200.11.

as a gerund. This is quite in keeping with the play on words common in the Sabhiyasutta. Hence with the proposed derivation of *chetvā* from $\sqrt{}$*kṣi* and *vidvā* from $\sqrt{}$*vyadh* the two lines of our passage mean—"Having wasted away the passions (*āsava*), (and) pierced through the desires (*ālaya*), the wise one does not enter the womb (again) . . . ."[33]

The book has been well printed and the editor and his collaborators (mentioned on p. 11) deserve our congratulations for having made it practically free from printing mistakes. If in spite of the great care devoted by them a few mistakes have remained, they only show how rare such misprints are. On p. 26, f.n. 1, line 5, *vaḍḍhetva* appears for *vaḍḍhetvā*: p. 75, l. 17 *duddakhīro* appears for *duddhakhīro*; p. 81, l. 1 *suvo vas uviṁ* for *suvo va suviṁ*; p. 110, l. 2 from below *nvavāya* for *uvavāya*. On p. 127, line 4 appears the short form Ś (among the Aśokan edicts giving the treatment $ny > nn$) after Dhau. and Jau. According to the list of the abbreviations Ś stands for Śaurasenī; but that is impossible here. Obviously it should have been Top. which stands for the Delhi-Toprā edict of Aśoka and which, besides the Dhauli, Jaugada and the Kalsi versions, gives instances of the change $ny > nn$.

—M. A. MEHENDALE.

33. I would rather like to put forward the following suggestion for consideration. The first line of the Gāthā is metrically defective. The irregularity can be removed if we suppose that originally *vidvā* (absolutive) going with *ālayāni* occurred also in the first line and that *chetvāsavāni* were read together. The first line would thus read—*chetvāsavāni ālayāni vidvā*. Later when the significance of *vidvā* (absolutive) in line one was lost sight of and was regarded as superflous in the presence of *vidvā* (=*vidvān*) in the second line, it was dropped and the line read as at present. LUEDERS (§ 179, pp. 132-133), however, makes a different suggestion to remove the metrical irregularity. He thinks that in the original text *āsinava* (which occurs in the Aśokan Pillar edicts II, III) was used in the place of *āsava*. He, therefore, proposes to reconstruct the first line of the original text as *chettu āsinavāni ālayāni*.

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